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DEPARTMENT OF AGRICULTURE

QUEENSLAND AGRICULTURAL JOURNAL

On South Burnett Dairy Lands.

LEADING FEATURES

SUNFLOWERS FOR SEED
THE QUEENSLAND NUT
THE CONTROL OF TOMATO PESTS
MILK AND CREAM GRADING

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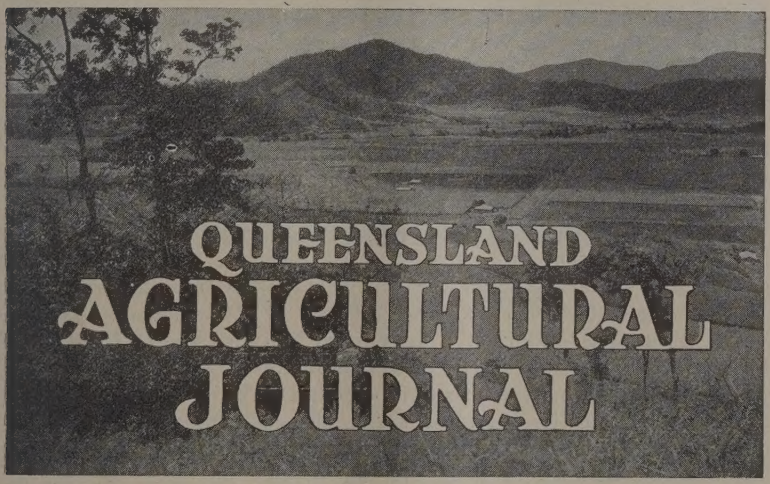


QUEENSLAND AGRICULTURAL JOURNAL

Volume 61 1 JULY, 1945 Part 1

Event and Comment.

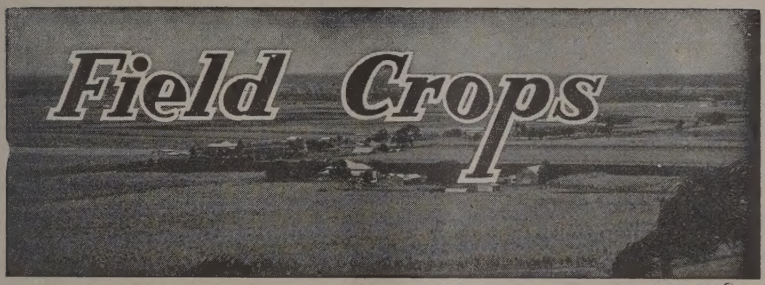
The Dairy Export Position.

Before the war Britain imported about 216,000 tons of butter annually from Empire countries, and 210,000 tons from foreign countries. During the war in Europe imports from foreign countries ceased (except small quantities from Argentina) and supplies from Empire countries fell considerably below pre-war levels. This was, however, because of the fact that the utilisation of milk had been greatly modified. In the course of his recent addresses to dairy farmers at Murgon and Kingaroy, Mr. W. Bankes Amery, Leader of the United Kingdom Food Mission to Australia, said that the production of milk for all purposes within Australia had been surprisingly well maintained at around about 1,100 millon gallons in the war years, although there had been a fall in 1944-45, due chiefly to bad seasonal conditions. Greatly increased quantities had, however, been consumed as liquid milk, and in the manufacture of cheese and condensed milk for military purposes. This re-allocation of usage had had a marked result on the export trade in butter. In 1932, for example, the year in which the Ottawa Agreements were concluded, the export of butter from Australia to Britain was 83,000 tons and of cheese 9,000 tons. By the first year of the war this had increased to the record levels of 109,000 tons of butter and 18,000 tons of cheese, no doubt with corresponding benefit to the primary producers of Australia. Then came the war in the Pacific; and, notwithstanding the success of the primary producers in maintaining milk production at the abovementioned high levels, the amount of butter now exported to Britain after the fulfilment of other demands had fallen to low levels.

The British Government would have been glad to receive at least 50,000 tons of butter in the current season and all the cheese that could be made available. Early in the year it was estimated, however, that the reduced production as a result of drought would only permit of the export of 40,000 tons of butter and very little cheese. The actual quantity of butter exported has amounted to about 37,000 tons, or one-third of the quantity exported at the outset of the war. This reduction has, of course, been made in full agreement with the Government of the United Kingdom after consideration of all the relevant facts. Looking, however, at the situation solely from the point of view of the maintenance of the butter ration in Britain, the net result is that through war emergencies of various kinds the export of butter from Australia has fallen from about 110,000 tons pre-war to about 37,000 tons in the present year. There has also been a substantial fall in exports from New Zealand below pre-war levels, although, fortunately, this season New Zealand exports are greater than those of last year. These figures show the magnitude of the problem which has confronted the rationing authorities in Britain and indicate how difficult it has been to maintain the meagre 2-oz. butter ration. Mr. Amery gave an assurance that no difficulty is foreseen in providing refrigerated tonnage for all additional supplies of meat and dairy produce which Australia may be able to make available.

The consumption of liquid milk in Britain has increased from approximately 860 million gallons annually pre-war to nearly 1,200 million gallons. A large proportion of this milk is supplied at reduced prices, or even free of charge to mothers and children on a priority basis. Present indications are that the whole of the milk production in Britain after the war, except perhaps during the height of the flush season, will be substantially required for consumption as liquid milk. On this hypothesis, the future production of butter and cheese in Britain, which during the war had been reduced by 75 per cent. and 50 per cent., respectively, will not reach pre-war levels. Consequently, the British market for milk products of all kinds has not been reduced by any agricultural developments in Britain during the war. The importance of this fact to Australian dairy producers, Mr. Amery told South Burnett dairy farmers, could not be exaggerated.

The existing long-term contracts assures a market for the exportable surplus of milk products until the end of June, 1948. There was a depressing period after World War I. when prices were falling, land values crashing, and there was general economic instability. These long-term contracts have been devised in the hope of stimulating production at the end of World War II., and at the same time avoiding the financial disabilities which developed at the close of World War I. It is believed that every possible effort should be made to overcome the difficulties of production at the present time, not only for the purpose of feeding Britain, although that is important enough, but also to preserve the world economic system upon which everyone's trade and livelihood ultimately depend.



Sunflowers for Seed.

W. R. STRAUGHAN, Senior Adviser in Agriculture.

THE giant sunflower, which is grown in Queensland for its seeds, has been cultivated in this State for a considerable number of years, but until recently was not regarded as a crop of any great importance. Widespread interest was created in the crop, however, when the importation of Australia's main requirements of sunflower seed was restricted as a result of wartime conditions, leading to a rapid increase in price from approximately £15 to as high as £45 per ton. The fixed ceiling price for the seed in 1945 is £30 per ton for ungraded, and £32 per ton for graded, seed. At these prices the crop is a remunerative one, and while they remain at or near the present level substantial acreages will no doubt continue to be grown in Queensland.

Origin and Uses.

The sunflower is a native of northern America, where it was one of the food plants of the Indians. Its culture has now spread to all the tropical and sub-tropical countries of the world, but assumes its greatest importance in Russia and the Danubian countries, where the oil extracted from the seed has many domestic and industrial uses and the oil-cake residue, which has a stock food value comparable with that of linseed and cotton seed cake, forms an important cattle fodder concentrate. In America, its chief use is as green fodder for cattle and as ensilage; oil also is extracted from the seed. In Australia it is grown almost exclusively for seed, which is one of the principal ingredients in some commercial bird seed mixtures. It is seldom used for fodder in this country.

Soil and Climate.

Soil and climatic requirements of the sunflower are somewhat similar to those of maize, but the sunflower will grow successfully on a wider range of soil types and is more tolerant of cool conditions. The sunflower also is generally of quicker maturity. It is this adaptability to poorer soils and colder climates, coupled with earlier maturity, that has given the crop such significant value in the more temperate regions of Russia and America. In America, the sunflower is grown extensively beyond the "corn belt" as a substitute for maize.

The sunflower plant, under normal conditions, is a gross feeder and best results are obtained on deep, rich, friable loams. Sandy soils, when the organic matter is in reasonable supply, provide favourable conditions. Shallow, stiff, or wet soils are least productive.

Cultivation.

The sunflower plant requires large quantities of water—about 7 gallons for every pound of dry matter produced—besides abundant plant foods to make its maximum development; preparatory cultivation must therefore be early, deep and thorough.

The initial ploughing should be as early in winter as possible, and as deep as practicable without inverting the subsoil. The field, particularly if the soil is of a heavy nature, should then lie through winter in the rough, thus allowing any rains to penetrate to the subsoil, while surface clods are gradually reduced by the fracturing influence of frost and wetting and drying.

Early spring workings will normally commence with a diamond-tooth harrowing to complete the breaking down of surface clods and to destroy small weeds. This should be followed by an implement—such as a rigid tyne or "stiff-shank" cultivator—stirring the soil nearly to ploughing depth. An alternative would be a second ploughing.

Subsequent cultivation will be dictated by soil type, climatic conditions, proximity to date of sowing, and the range of implements available. The ultimate objective should be a fairly firm and fairly fine-surfaced seed bed, similar to that prepared for maize. During its preparation as much moisture as possible should be trapped. To achieve this, the surface should not be reduced to a fine tilth until immediately before sowing. Weed growth should be kept in check in the earlier stages with stirring types of implements, which will assist in keeping the soil open and pervious to moisture, rather than discs, which should be used only if weeds threaten to get beyond control or if a rough surface cannot be broken down sufficiently quickly. Later, diamond harrows are indicated following light showers, or a spring-tyne implement if the surface shows an inclination to run together, particularly following heavy falls of rain.

During growth inter-row cultivation will be necessary to keep down weed growth up to the time the crop, which grows rapidly, covers the ground sufficiently to check such competition. Care should be taken during the inter-row cultivations—especially the second, which normally is also the last—that damage is not inflicted on the root system, which rapidly reaches across the rows.

Sowing.

Sowing may commence as soon as fear of frost is over and be continued into January of the following year. Midsummer is generally accepted as the most convenient time to sow, since plantings at this time allow the crop, which requires abundant moisture for growth, to develop during the wet months of January to March and to ripen during the drier autumn months. Early sowings tend to ripen during the wet season and late sowings are subject to damage by frost.

The usual rate of sowing has been 4 to 5 lb. of seed per acre, but there is now a tendency for farmers to halve this rate, as it is contended that the lighter sowing facilitates harvesting by reducing the plant population of the field without, apparently, adversely affecting the yield. Where there is a prospect of mechanical harvesting, however, a revision of this planting rate may be desirable to reduce the height of growth, and 8 to 10 lb. of seed per acre is suggested. A heavy rate would be desirable if the crop were grown for ensilage.

The crop is usually planted with a maize planter in drills 4 feet to 4 feet 6 inches apart. The grain drill with appropriate outlets blocked to sow 3 feet 6 inch drills is becoming popular. Plants usually average 12 to 18 inches apart in the drills. Planting at 15 inches apart in drills 4 feet wide would require 2 lb. of seed per acre.

Harvesting.

The heads should be thoroughly dry before harvesting commences. They are usually cut with pruning shears and then thrown into a wagon, dray, or other vehicle which has been lined with sheets of bagging or other suitable material to retain any loose seed which may be shed. The crop is then carted direct to the thresher. Should the heads require further drying, however, they may be carted to a suitable shed, where they should be spread evenly on racks to dry.

The grain header used as a stationary thresher is the most convenient machine for threshing sunflower heads. The seed is easily removed, but the header requires certain adjustments. The concave should have all bars removed and be opened to its full extent. The drum should be slowed down and the fan draft increased. The rate of threshing will be controlled by the capacity of the riddles to handle the refuse, most of which escapes the straw-walkers.

Recently a successful attempt was made to harvest the standing crop with the header-harvester, but before this practice is likely to become universal a selection of dwarf types and an adjustment of the sowing rate and plant spacings would appear necessary. Several adjustments besides the fitting of an extended comb are required.

Yields usually vary from 700 to 1,500 lb. of seed per acre, and the general average is in the vicinity of 1,000 lb.

The seed is marketed in 3-bushel corn sacks which, when well filled, hold slightly over 100 lb.

Seed Selection.

The Giant or Mammoth Russian, a grey-striped variety, was the principal variety introduced into Queensland, but the indiscriminate selection of seed has given rise to a mixed type of few uniform characteristics. Certain growers have made selection for size of head and have perhaps included such characteristics as dwarfness and colour of seed, so that to-day a number of strains occur throughout the State.

At this juncture it would be difficult to define the most desirable type of plant, but certain characteristics suggest themselves. Of these dwarfness would appear to be of prime importance, particularly if the mechanisation of harvesting is to be made practicable.

Size of the head is another obviously important factor. Care should be taken to note the seed in the centre of the head, which may be undeveloped. The large, grey grain is preferred by buyers and so selection should be made in this direction rather than to the small dark seed.

The seed should be firmly packed in the head, which may be either flat or with the outer edges curved backwards towards the stem. Heads are generally pendulous and there appears to be no advantage in selecting away from this feature.

Early maturity and a strong erect stem free from deformities are essential features.

The small amount of seed required to establish a crop of sunflowers would warrant an intensive selection of seed by any intending grower.

The Queensland Nut.

J. M. WILLS, Adviser in Horticulture.

[*Continued from p.* 351 *June,* 1945.]

Cultivation.

In the early years cultivation of the surface soil, particularly in the vicinity of the trees, is essential for the maintenance of vigorous growth. Where surface crops, such as beans and peas, or fruits, such as bananas, papaws, or pineapples, are planted between the young trees, the preliminary preparation and subsequent cultivation of the land benefits nut trees and secondary crops alike. When the trees are five to six years old, deep cultivation in the immediate vicinity of the tree should be discontinued; however, the surface soil should be lightly worked to prevent packing and to control weeds. In older groves, animals are often used to eat down grass or succulent weed growth and this is a sound practice. Animal manure has an invigorating effect upon the trees, besides helping to keep the main lateral roots covered. As the grove ages, there is a tendency for these roots to work to the surface, due partly to natural growth and partly to the drift of surface soil, or, in the case of trees planted on slopes, erosion. When steep slopes, such as constitute the greater proportion of banana plantations, are planted with nut trees, provision should be made to prevent surface soil erosion by placing stones or logs in such a way that any wash will be caught and held in the vicinity of the trees, eventually setting up a series of small ledges and preventing the rich surface soil from being washed away. Attention also should be given to the growing of a good cover crop—legumes for preference—or, if this is not possible, succulent harmless weeds should be allowed to cover the surface before the commencement of the heavy seasonal rains. A good mulch of leaves, grass, rushes, or similar material benefits the trees by retarding undesirable weed growth and by improving the soil.

Pruning.

Correct pruning directs the energy of the Queensland nut tree into the formation of a sturdy, stocky, well-balanced tree. Early pruning should be confined to the development of properly spaced limbs, on which the head of the tree is to be formed. If left to natural inclination, the young seedling will often continue to grow as a single stem, eventually developing into an ill-shapen, bodyless tree. Lateral branching may be induced by pinching out the young terminal buds when the seedling has attained the desired height—that is, about 2 feet 6 inches

to 3 feet from the ground. Subsequent growth must be carefully watched in order to prevent the young main limbs from growing immediately opposite each other, because new growth, for preference, will arise from the buds situated at the base of the terminal leaf axils. One bud should be permitted to develop; then on the removal of the remaining buds—usually two in number—fresh young growth will be promoted from buds situated at the base of leaf axils lower down the stem. Those permitted to develop should not be on the same side as other limbs, but alternately opposite in order to overcome the possibility of splitting down the trunk during high winds or when carrying heavy crops. The young terminal growth should be regularly inspected and shortened off at intervals of upwards of 2 feet. It will then be found that secondary lateral growth will appear, assisting in the formation of a squat, bushy-headed tree possessing an abundance of short fruiting wood and preventing the domination of long, whippy growth. If the main stem of the tree is allowed to grow too high before being pruned, the subsequent growth often has a tendency to be long and scantily branched, resulting in the formation of a high, ill-formed tree.

Plate 1.
CLUSTERS OF MEDIUM-SHELLED NUTS OF THE VARIETY *Integrifolia*.

At times, young trees do not come away well on the original stem, this failure being due to a variety of causes, and a cluster of base shoots may arise as a consequence. In such cases, it is advisable to select the strongest and best-situated shoot to form the main stem of the tree, the others being cut cleanly away. Where young trees have become very dense through too many shoots having been permitted to grow, thinning-out is necessary to open up the trees to light and air. After the foundation of the tree has been formed, little pruning is necessary beyond removal of dead or dying wood and badly placed limbs, in order to keep the centre open and promote an even distribution of fruiting on the inside.

As the tree grows older it will be possible to gradually lift the head by removing the lower limbs. Where large cuts are necessary, they should be smoothed off, and painted with tar or a good lead paint to prevent the possibility of dry rot setting in and so weakening the stem. With care, the wounds soon callous over, and little effect is noticeable in the tree. The work should, however, be done after the crop has been removed and before the commencement of spring growth.

Plate 2.
A CLUSTER OF THIN-SHELLED NUTS OF *Macadamia ternifolia*.

Bearing Habit and Harvesting.

In Australia and elsewhere it has been observed that the crop varies in quality throughout the season; usually the first few nuts which drop are poor in quality, small, and shrivel rapidly. If the trees are constitutionally strong and the season is fair, however, this represents a very small percentage of the crop.

Variations in nuts from different localities may be influenced by such factors as origin of seed, cultivation, climate, and location. The present commercial demand tends towards the deep-brown coloured, smooth-shelled nut, because of its rich flavour. The medium to thin ovoid shell (Plates 1 and 2) is attractive in appearance, with a uniformly full kernel. The sharply-pointed, elongated, roughly-shelled nut is not so attractive; it grades out unevenly and has a greater proportion of shell to kernel.

Normally, blossoms appear in early September and flowering may continue until early October. Large quantities of young nuts are usually set but are somewhat reduced by the influence of natural characteristics, wind, adverse seasonal conditions, caterpillar attack, and other causes, so that a cluster is rarely found containing more than twenty nuts; the average is about ten, while it is not uncommon to find clusters of only two or three. The nuts mature

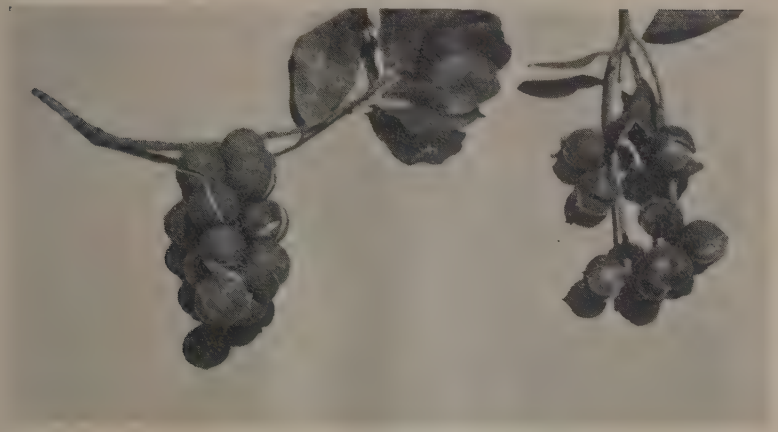


Plate 3.
CLUSTERS OF NUTS SHOWING HUSKS SPLITTING, INDICATING MATURITY.

in from six to seven months. They must be allowed to ripen on the tree to attain proper maturity (Plate 3). Immature kernels quickly become affected with a mould which renders them unsuitable for consumption, so nuts intended for market should be fully matured. The mixing of unripe with matured nuts must be avoided.

After harvesting, the nuts should be taken from the green husks and washed to remove any discolouration caused by adhesion to the husk, thus improving its appearance and leaving the shell a clean, even brown colour. A simple method is here suggested:—When husked, tip the nuts into a kerosene tin or similar container until it is half-filled; then pour in sufficient water to cover them. By taking the handle and twisting the tin quickly from side to side, the movement of the nuts against each other has a cleansing effect; furthermore, any hollow nuts will float to the surface, to be easily rejected. The nuts should then be placed on benches or in shallow boxes for a day or two to dry.

Before marketing, at least a month should be allowed for the nuts to "harden off." Shallow trays or boxes are suitable for this purpose, and they should be stacked in a cool, semi-dark shed out of the weather.

There is considerable controversy over the weight of nuts produced by a single tree, also the age at which trees commence bearing. Several factors have a marked influence on maturity, namely:—Soil conditions, cultivation, soil moisture, location and aspect, &c. Trees growing in sheltered, warm locations bear much earlier than do trees growing in cold or exposed situations, such as on south-easterly and southerly aspects, which get very little winter sunlight. Under optimum conditions trees may be expected to produce their first crop when 6-7 years old, but allowance must be made for the wide variation in the development of seedlings. Seedlings grown from the same tree may develop irregularly under similar conditions and instances of as much as two years between trees of the same age coming into bearing are known. The following production figures of trees which have been under observation for several years may be taken to represent a fair average yield.

Number of trees:—450.

Year.	Weight in lb.	
1940	1275	
1941	2366	
1942	2056	(50 trees damaged by fire.)
1943	2449	
1944	6019	

The figures given represent actual weight of graded nuts marketed; the actual weight of nuts produced probably exceeded this amount by about 10 per cent. Most of the trees are 14 years old and were planted through bananas; the land was grassed down after the bananas were eradicated in 1938 and stock have since been grazing on the land.

After a tree comes into bearing the crop increases each year until from ten years and upwards good type trees regularly produce commercial quantities of nuts.

Dehusking.

Standard corn-shellers are easily adaptable for removing green husks. In old type shellers, the tongue of the sheller should be removed and a piece of thin board fitted down beside the rollers and the housing on each side to prevent the nuts from jambing between the rollers and the housing. The tension spring should be loosened sufficiently to allow the nuts to pass between the rollers without being damaged; about ¼-inch clearance is usually sufficient.

Modern corn shellers only need the tension screws at the top of the machine slackening off sufficiently to allow the nuts to pass through between the rollers.

The speed at which the driving wheel is turned should not exceed 30 revolutions per minute, otherwise a percentage of nuts will pass through unhusked, particularly where the size of the nuts varies to any great extent.

Grading.

A simple but effective grader for sizing the nuts into small, medium and large sizes can be made cheaply on the farm by any person handy with hammer and saw. It consists of a table in which are two, three, four or more openings or slots graduated from half-an-inch at the top end to one-and-and-a-half inches at the bottom.

The top end, which should be about six inches higher than the bottom end, consists of a box with six-inch sides into which the nuts are poured in bulk. By means of < shaped guides the nuts are diverted to one-and-a-half inch holes cut or bored in the bottom side of the box, so that the nuts roll out singly on to the slots, down which they travel until they drop through into boxes underneath. Strips of half-inch round beading tacked along the top edges of the slots help to keep the nuts in the grooves.

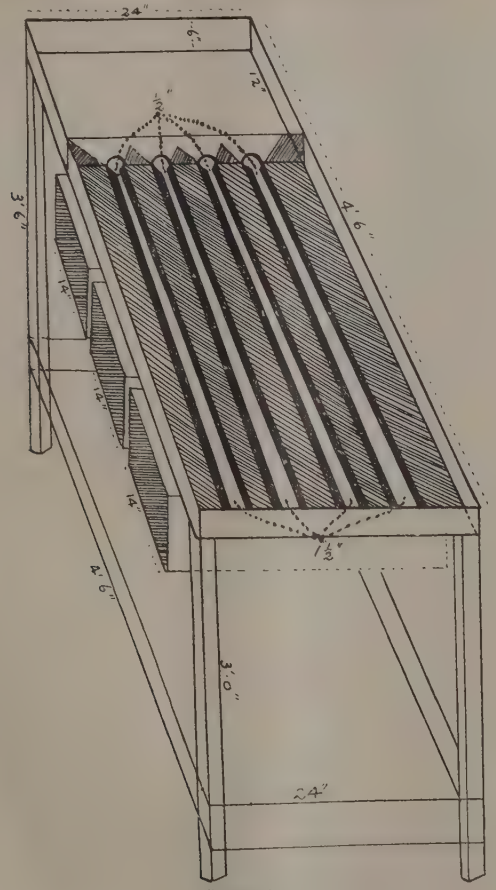


Plate 4.

GRADER FOR SIZING QUEENSLAND NUTS.

In the drawing (Plate 4) it will be noted that the beading is cut on an angle where it meets the holes through which the nuts emerge from the box. This facilitates the movement of the nuts and keeps them rolling. The < shaped guides inside the box can be made from galvanised iron bent to shape, or from pieces of four-inch or six-inch wide timber, such as used in fruit cases, cut to suitable size and nailed on. The plan and the dimensions shown are quite optional. A grader with only one slot will work quite well, but where a large quantity of nuts has to be handled a table with a number of slots will enable the grading to be done much more quickly. Up to 50 lb. of nuts can be graded per hour with a single slot grader.

Naturally, round types of nuts run and grade more evenly than pointed or oblong nuts, and if the two kinds are mixed together some subsequent hand sorting may be necessary. It is an advantage, therefore, when harvesting to keep the pointed nuts, as far as possible, separate from the round types.

CHARACTERISTICS OF TYPES OF QUEENSLAND NUT.

—	*M. ternifolia.*	*M. ternifolia* (Mammoth).	Var. *integrifolia.*	Var. *integrifolia* Everbearing.
Tree	Rounded top ; dense, vigorous growth	Upright ; coarse, vigorous growth	Stocky ; rounded top ; open habit of growth	Vigorous, rounded top ; well-spaced limbs plentifully supplied with fruiting spurs
Leaves	Rigid in texture ; elliptical or long and narrow ; excessively spiny ; young leaves pink or red in colour	Coarse and large ; elliptical or very long ; excessively spiny ; young leaves red	Rigid in texture ; obovate ; almost entirely free of spines ; young foliage yellow to lemon	Rigid in texture ; obovate or elliptical ; free of spines ; young foliage lemon green to yellow
Flowers	Pink to light reddish brown ; blooms August-October	Pink ; blooms August-September	Creamy yellow ; blooms August-September	Creamy yellow ; blooms periodically from June through to March
Bark	Light greyish green or brown	Browny grey	Greyish to green	Grey to green
Age of bearing ..	6 to 7 years	6 to 7 years	6 to 7 years	6 to 7 years
Fruiting ..	One crop annually	One crop annually	Mostly one crop annually ; sometimes a light second crop is set	Bears flowers and fruit more or less all the year
Shell and texture	Smooth to knobby ; sometimes flecked ; thick shell tough and coarse ; thin shell smooth and fine ; brown colour	Knobby, uneven surface ; medium to thick shell ; brown colour	Smooth surface ; medium to to thick ; brittle ; brown colour	Smooth surface ; medium thickness ; brittle ; brown colour
Nut unshelled ..	Ovoid to elliptical	Ovoid to elliptical	Mostly spherical	Ovoid to spherical
Quality	Fine ; rich in soil	Brittle ; rich in oil	Texture finer than *ternifolia* ; rich in oil	Fine texture ; rich in oil
Pests	Nut-borers, caterpillars, leaf-miners	Nut-borers, caterpillars, leaf-miners	Nut-borers, caterpillars, leaf-miners	Nut-borers, caterpillars, leaf-miners

Thin-shelled nuts of any grade are in ready demand, and when marketed should be so labelled, provided the whole of the consignment is consistent with the label.

New nuts should not be packed with older ones. If possible, each week's harvesting should be kept separate. This ensures a uniform standard of maturity.

Shelling.

In all types the proportion by weight of shell to kernel varies; this, in addition to hardness of shell, suggests that marketing the kernels only would be the most satisfactory method. Machinery for cracking the shells and separating the kernels is now in use. Small home machines are obtainable. During the cracking process some kernels are unavoidably broken, but are acceptable to manufacturing confectioners.

Shelled kernels do not deteriorate to any appreciable extent if kept away from light and moisture, the flavour and oil content being maintained. As a roasted and lightly salted confection, they are in strong demand, and this treatment considerably enhances their natural good keeping qualities.

Pests.

Queensland nut trees appear to be free from most forms of disease, but various insects may cause considerable damage.

Information on pest control is obtainable from the Department of Agriculture and Stock, Brisbane.

Types of Queensland Nut.

As mentioned earlier, a variety of types of Queensland nut is recognized. The distinguishing characteristics of the four main commercial types are set out in the accompanying table and a description of the variety *integrifolia* is given below:—

Macadamia ternifolia var. integrifolia.

Some doubt exists as to whether this is a variety or merely a type, but for the purpose of these notes the more familiar term "variety" is used for differentiating between *M. ternifolia* and *M. ternifolia* var. *integrifolia*. The production of smooth-shelled nuts has been said to be restricted to the var. *integrifolia*. Such, however, is not the case, because trees of *M. ternifolia* can be cited as producing nuts with a smooth and brown-flecked shell. In common with *M. ternifolia*, a wide variation has been observed in the shape of leaves and nuts of the var. *integrifolia*. The habit of bearing more than one crop a year is confined to var. *integrifolia*. Despite this heavier cropping, however, under natural conditions the most widely distributed variety is *M. ternifolia*, suggesting the possibility of its requiring less exacting soil conditions, although under cultivation the variety *integrifolia* readily becomes established and flourishes equally as well as *M. ternifolia*.

The "everbearing" type may carry blossoms and nuts in different stages practically throughout the year, the main flowering periods being June and November. The nuts are usually ovoid in shape with a brown, smooth shell of medium thickness, and are borne similarly to those of *M. ternifolia*. Maturity indications are identical and extend over a similar period of time. The kernels fill the shell and are rich in flavour,

with an oil content equal to that of other varieties. The tree is consistently robust, with full rounded top; main and secondary limbs growing somewhat laterally maintain an open habit of growth admitting light to the interior, thereby inducing a fairly even setting of nuts over the whole tree.

The extensive root system is mostly of a shallow nature, and young trees in exposed positions, unless well staked, often blow over during wet, stormy weather; in aged trees the main lateral roots become exposed near the trunk, necessitating protection to keep them covered with soil. Should the roots become badly exposed through erosion and natural development, a diminution in cropping will be observed. On the roots being well covered again, a return to consistent heavy bearing is the usual result.

Propagation is mostly from seed, which should be planted as soon as possible after falling from the tree. Germination may extend from 30 to 120 days. When selecting seed from the "everbearing" variety, best results will be obtained from seed which matures during April-May. If the nuts are planted immediately, young seedlings are then sufficiently well advanced for planting out during the following autumn. Seedlings transplant as readily as those of other varieties under suitable conditions, and when once properly established rapidly develop into attractive and shapely trees.

With this variety some immature nuts are always gathered, as it is difficult to harvest the whole crop at the correct stage; immature nuts are unpalatable and deteriorate quickly. Care should be taken to exclude these from matured nuts; otherwise they may adversely affect the disposal of the whole crop.

Acknowledgments.

The assistance of the undermentioned growers in supplying information used in the preparation of these notes is cordially acknowledged:—Messrs. A. Powell, W. Hill and H. J. Latimer, of Gilston; Messrs. A. Barns, L. Grimshaw and D. Tulloch, of Mudgeeraba; and Messrs. G. F. Hinde, of Southport and L. Gowlett, of Tugun.

Note.—The acreage figures for the Queensland Nut given on page 345 of the June *Journal* refer to Hawaii.

Plate 5.
ON WYAGA, GOONDIWINDI, QUEENSLAND.

PLANT PROTECTION

The Control of Tomato Pests.*

W. J. S. SLOAN, M.Sc.Agr., Agronomist.

THE tomato plant is attacked by many pests, and good crops can seldom be grown without the application of control measures. To employ these efficiently requires some knowledge of the life history and habits of the several pests, so that damage can be correctly diagnosed and appropriate steps taken to reduce losses.

Tomato pests may be grouped as—(I.), root and seedling pests; (II.), stem and foliage pests; and (III.), fruit and flower pests, in accordance with the part of the plant with which they are principally associated. The following key should simplify the identification of the various pests in the field:—

I. ROOT AND SEEDLING PESTS.

1. Plants stunted; lower leaves wilt and die in dry weather; sudden collapse of plants not uncommon after rain; bead-like swellings of varying sizes on roots .. .. **Nematodes**
2. Plants wilt and die; roots eaten; light-brown, thick-bodied beetles about ¾ inch long present in soil .. .. **Brown Scarab Beetle**
3. Seedlings collapse; stem chewed at or near ground level; one or more larvae found in soil near stem.
   (a) Smooth, soft-bodied, greyish-green or greyish-brown caterpillars which curl up when touched; 1½ inches long when full-grown **Cutworms**
   (b) Slender, hard, shiny, light-brown larvae; about ¾ inch long when full-grown; parent beetles about ⅓ inch long also present **False Wireworm**
4. Foliage and sometimes stem eaten; grasshoppers present **Grasshoppers**

II. STEM AND FOLIAGE PESTS.

1. Stem rusty-brown or smoky-coloured and smooth; lower leaves wilt and die .. .. **Mites**
2. Lower leaves wilt and die; green leaves show numerous white spots; swarm of green, winged insects about ⅛ inch long on each plant .. .. **Jassids**
3. Stem with swollen areas in which internodes are short .. **Mirids**
4. Small, soft-bodied, green insects, clustering in colonies under leaves and around young growth .. .. **Aphids**
5. Green caterpillars feeding on foliage; 1½ inches long when full-grown .. .. **Leaf-eating Looper**
6. Stem of young plants tunnelled by dull white larvae ½ inch long .. .. **Potato Tuber Moth**

* This article was published in the October, 1941, issue of the Journal. It has now been revised and added to in order to cater for a large volume of inquiries for information regarding the control of tomato pests. When revised Mr. Sloan was still an officer of the Science Branch.

III. FRUIT AND FLOWER PESTS.

1. Larvae in or on the fruit.
   (a) Caterpillars often conspicuously coloured; 1½ inches long when full-grown .. .. **Corn Ear Worm**
   (b) Dull white or greenish-tinted caterpillars, ½ inch long when full-grown .. .. **Potato Tuber Moth**
   (c) Soft-bodied, greyish-green or greyish-brown caterpillars feeding at night and remaining in soil under plants during the day; 1½ inches long when full-grown .. .. **Cutworms**
   (d) Fly maggots living in fruit .. .. .. **Rot and Fruit Flies**

2. Fruit with discoloured areas on skin; bugs present.
   (a) Green shield-shaped bugs; ½ inch long .. **Green Vegetable Bug**
   (b) Green or green and brown shield-shaped bugs; $\frac{3}{16}$ inch long **Shield Bugs**
   (c) Slender, winged, greyish-brown insects; $\frac{1}{8}$ inch long **Rutherglen Bug**
3. Cream-coloured insects in blossom; $\frac{1}{16}$ inch long .. .. **Thrips**

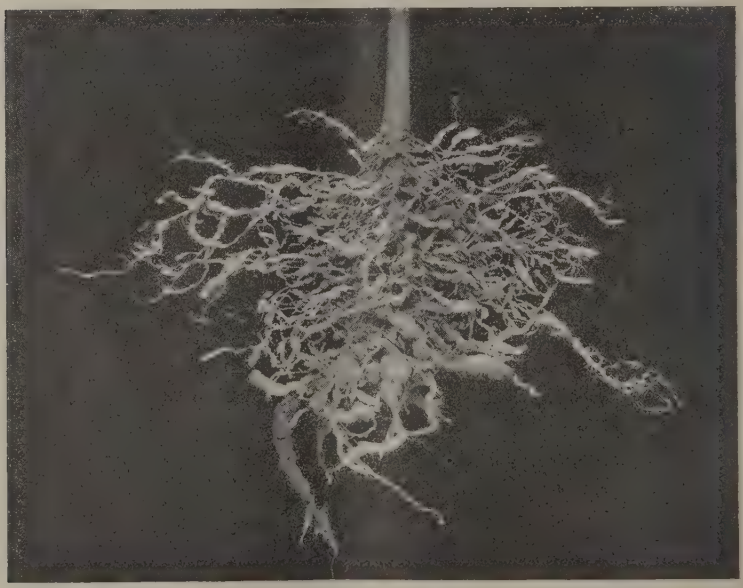


Plate 6.
NEMATODE GALLS ON TOMATO ROOTS.

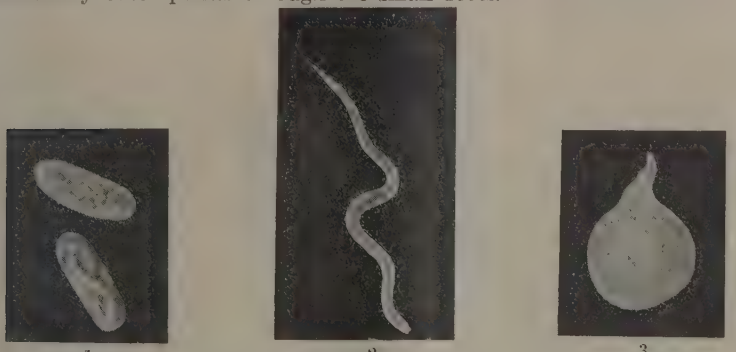
NEMATODES.

Nematodes* infest the roots of tomato plants of all ages, but the effects of infestation may not be obvious until fruit setting commences. Severely attacked plants are stunted and unhealthy, the lower foliage wilts and dies in dry weather, and the fruit does not fill out. After wet weather, affected plants may collapse suddenly. The presence of nematodes is easily determined by examining the roots, which, when infested, are distorted and somewhat beadlike in shape (Plate 6). On seedlings, the swellings may not be very large.

* *Heterodera marioni* Cornu.

Life History and Habits.

Nematodes live part of their life in plant tissue and part in the soil, where they can persist for a very long time, even in the absence of food plants. The full-grown female nematodes (Plate 7; fig. 3) are white, pear-shaped, and about one-twenty-fifth of an inch in length, and may be seen on the exposed surface when one of the larger root swellings is sliced through with a sharp knife. The very small, worm-like male also occurs within the roots, but is more difficult to detect. The eggs (Plate 7; fig. 1) are microscopic in size and can survive for long periods in the soil. From these emerge young, thread-like nematodes (Plate 7; fig. 2), which move about in the soil to a limited extent, and eventually enter plants through the small roots.



1 2 3

Plate 7.
ROOT KNOT NEMATODE.
Fig. 1.—Nematode eggs × 150. Fig. 2.—Larval nematode × 150. Fig. 3.—Adult female nematode × 30.
[Drawings by I. W. Helmsing.

Nematodes attack many weeds and crop plants; hence the difficulty in obtaining ground free from infestation. They occur in most soil types, but losses are generally most severe in light, sandy loams.

Control.

Complete eradication of these pests in infested fields is not practicable. Attention should therefore be directed towards the production of healthy seedlings, and the maintenance of good growing conditions when they are transplanted into the field. The following measures are accordingly recommended for dealing with nematodes. New ground should be selected for seed-beds and the beds fired before planting. This may be done by placing brushwood and branches evenly over the surface to a depth of 6 to 8 inches and burning them when the soil is neither dry nor excessively wet. When removing seedlings for planting, any showing swollen roots should be discarded. After transplanting, it is essential to maintain the health of the plants in the field by judicious fertilizing, adequate cultivation, and careful irrigation. Furthermore, the grower should remove and destroy by burning all severely affected plants in the field, and he should avoid growing tomatoes on the same land for more than two years in succession. Most grasses, maize, wheat, sorghum, peanut, and velvet bean resist nematode attack, and a suitable rotation including some of these crops, one of which should be a green manure, usually keeps the nematode population at a relatively low level.

Plate 8.
BROWN SCARAB BEETLE × 2.

BROWN SCARAB BEETLE.

Plants may be destroyed by the brown scarab beetle* which feeds on the roots. Outbreaks of this pests are sporadic, but losses can be very severe. The adult beetles live in the soil, and are typical, thick-bodied Scarabs, light-brown in colour and about ¾ inch in length (Plate 8). Their larvae are of the white grub type, and occur in soils rich in organic matter or in compost heaps, but, so far, they have not been recorded as injurious to tomatoes.

[*Drawings by I. W. Helmsing.*

Plate 9.
BROWN CUTWORM.

Fig. 1.—Eggs × 20. Fig. 2.—First-stage larva × 8. Fig. 3.—Final-stage larva × 1½. Fig. 4.—Pupa × 2.

* *Isodon puncticollis* Macl.

Control.

The use of insecticides is usually not practicable for the control of these Scarab beetles. Thorough cultivation of the field before planting and during the growth of the crop may give some relief from attack by this minor pest.

CUTWORMS.

The larvae of several moths are called cutworms because they attack the stems of seedlings at or near ground level. They can usually be found just below the surface of the soil. Feeding takes place at night and attacked seedlings collapse, but, on older plants, stem injuries are less important and feeding is then confined mainly to the foliage. On untrellised fruiting bushes, large irregular holes may be made in the fruit near the ground. Injury to seedlings, which usually takes place shortly after transplanting into an infested field, constitutes the commonest and most serious loss from cutworm infestation. Severe injury is common in light soils.

Life History and Habits.

The moths of the brown cutworm* (Plate 10), which is a widely-distributed pest and the commonest cause of cutworm losses in Queensland, have greyish-brown or greyish-black forewings with variable markings; the hind wings are greyish-white, with smoky margins, and the wing spread is about 1½ inches. The females lay batches of eggs (Plate 9; fig. 1) on the soil surface, or underneath the leaves of low-growing weeds. After a few days the eggs hatch, and the young caterpillars feed on the plants at night, sheltering in the soil during the day. The soft-bodied, greyish-green or greyish-brown larvae (Plate 9; figs. 2 and 3) become full-grown in four to seven weeks, and are then about 1½ inches in length. They make their way into the soil and pupate at a shallow depth in earthen cells and, after a further two to three weeks, the adult moths emerge from the pupae (Plate 9; fig. 4).

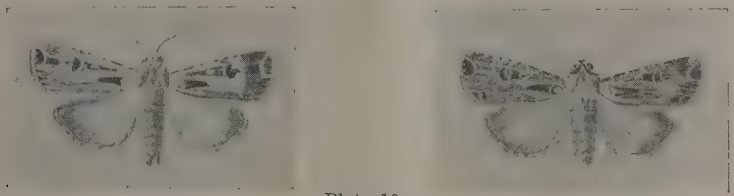


Plate 10.
Brown Cutworm.
Fig. 1.—Male moth. Fig. 2.—Female moth. Both figures natural size.
[*Drawings by I. W. Helmsing.*

Cutworms feed on numerous weed plants and if land carrying low-growing weeds is cultivated just before planting any cutworms present will attack the tomato seedlings. Losses may therefore occur in patches or be generally distributed throughout the field—depending on the distribution of the weed growth before cultivation. The presence of cutworms may be detected by examining the top few inches of soil around the base of destroyed seedlings.

* *Euxoa radians* Gn.

Control.

Fortunately, control measures for cutworm outbreaks are very efficient if properly carried out. These include thorough preparation of the soil and the suppression of weed growth for at least four weeks before the seedlings are transplanted.

When seedling losses are noticed, a Paris green–bran bait must be applied immediately. The bait is prepared by thoroughly mixing 1 lb. of Paris green with 25 lb. of bran. One quart of molasses is then dissolved in a pint of boiling water and the solution made up to two gallons with cold water. The solution is finally poured on to the poisoned bran and the whole is mixed to form a uniformly moist, crumbly mash.

If the whole field shows signs of infestation before planting, the bait should be broadcast at a rate equivalent to 50 lb. dry weight of bran per acre; after planting, it may be scattered thinly along the rows close to the plants. If the attack is restricted to a small area, only this, together with a marginal strip, need be treated. When cutworms are very numerous, two or more applications of bait may be required in order to obtain control. The bait should always be applied in the evening, because cutworms are night feeders and the bran mixture must be fresh and attractive when they are seeking food. It should not come in contact with the stems of the plants, otherwise injury may occur.

Paper collars are used in some districts to protect seedlings from cutworms and other pests. The size of the paper used for this purpose depends on the size of the seedlings; for seedlings up to 8 inches high, 4-inch by 3-inch pieces are convenient. The paper is wrapped around the stem, and the seedling is placed in the soil so that there is a 2-inch collar of protecting paper above the surface. Papers are carried on a string attached to the planter's belt and flicked off as required. This protective measure slows up planting to some extent, and does not reduce the field population of cutworms, the progeny of which may later cause injury to fruit borne on untrellised vines.

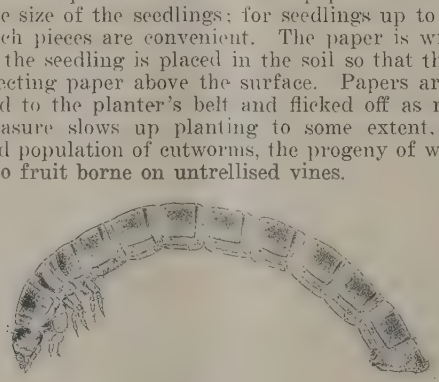


Plate 11.
FALSE WIREWORM × 5.
[*Drawing by William Manley.*

FALSE WIREWORM.

Both the false wireworm and its parent beetle* injure tomato seedlings at ground level in much the same way as do cutworms. Occasionally, however, the false wireworm also tunnels into the stem for a short distance. When this pest is responsible for seedling injury, either the beetles will be found on the soil surface or the hard, slender larvae may be located just below the surface of the soil near the injured seedlings.

* *Dasus macleayi* Blkb.

Life History and Habits.

The adults are small, stocky beetles, about $\frac{1}{3}$ inch in length, their apparent colour being similar to that of the soil on which they occur. They lay their eggs in the soil and the larvae which hatch from them are shiny, light-brown in colour, and measure about $\frac{3}{4}$ inch in length when full-grown (Plate 11). On completing their growth, the larvae pupate in the soil and in due course the beetles emerge from the pupae, thus completing the life cycle.

Control.

The Paris green–bran bait recommended for dealing with cutworms efficiently controls both the larvae and the beetles; paper collars may also be used against this pest.

GRASSHOPPERS.

Adult and immature grasshoppers (Plate 12) occasionally attack the foliage and stems of young tomato plants in seed-beds and in fields, particularly during dry weather. If these pests are numerous, many young plants may be destroyed, and difficulty may be experienced in obtaining a satisfactory stand. A number of species are concerned, ranging from 1 inch to $3\frac{1}{2}$ inches in length, but two* are particularly common in central coastal Queensland.

Plate 12.
GRASSHOPPER (*Valanga irregularis* Walk.) × $\frac{2}{3}$.

Control.

Handpicking and the arsenate of lead dust or spray usually applied for the control of leaf-eating pests will check small populations of grasshoppers in the seed-beds. Where these measures are insufficient, the Paris green–bran bait employed for cutworm control may be broadcast around the beds for a radius of 30 yards or more.

When a field crop has to be protected, the standard grasshopper bait is more economical than the Paris green–bran bait. It contains

* *Valanga irregularis* Walk. and *Peakesia straminea* Sjost.

½ lb. of arsenic pentoxide, 1 to 1½ quarts of molasses, 25 lb. of bran, and 2½ gallons of water. The arsenic pentoxide is dissolved in 1 pint of boiling water; the molasses is also dissolved in the same quantity of water in a separate vessel. Both solutions are stirred, and half of the remaining water added to each. The two solutions are then mixed, stirred, and added to the bran which has previously been spread out on a mixing board or sheet of iron. The whole is then thoroughly mixed until a loose even-textured moist mash is obtained.

In an infested field, the bait should be distributed along the rows close to the plants and broadcast around the field for a margin of 30 yards. Several applications at three- or four-day intervals may be necessary if there is a persistent inward migration of the pests. In this case, the bait should be applied during the day for, unlike the cutworms, the grasshoppers feed during the day time.

MITES.

Mites* affect tomato plants of all ages and may be responsible for serious foliage losses, the cause of which is frequently rather puzzling to the grower. The first symptom of injury is a slight curling of the lower leaves which then show a silvery sheen on the under-surface; later, these leaves become bronze-coloured, droop, and finally die. The lower part of the stem loses its surface hairs, becomes smooth, rusty-brown or smoky-coloured, and may later develop small, superficial

Plate 13.
TOMATO MITE.—Portion of leaf magnified × 20 to show mite infestation.

cracks. As infestation increases, the mites gradually spread, discolouring the stems and destroying the foliage, until only the young terminal growth remains. Thus the fruit is exposed to sunburn, plant growth is retarded, and blossom setting curtailed. In severe attacks where

* *Phyllocoptes lycopersici* Tryon.

infestation extends to the terminal growth, the young leaves may be distorted. Fruit may also be attacked and, when this is the case, the skin is discoloured and numerous small cracks appear, mainly at the stem end, but sometimes all over the surface. Although edible, such fruit is unmarketable. Many of the symptoms associated with mite attacks can be confused with the effects of dry weather or some wilt diseases, but the discolouration of the stem is characteristic of mite infestation and can be used for diagnosis.

Life History and Habits.

The tomato mite is extremely small, and though it may occur in large numbers on a plant it cannot be seen with the naked eye. Therefore growers must be able to recognise the injury caused by the mites in order to detect their presence. Under an ordinary hand lens the mites are seen as torpedo-shaped, cream-coloured, slowly moving specks on the stems, leaves or fruit (Plate 13). The eggs are smooth and white, and are laid on the surface of the plant.

This pest occurs on several weeds botanically allied to the tomato, such as the green and Cape gooseberries and two varieties of wild black currant. At times it may be abundant also on English potatoes. Infestation spreads quickly through a field of tomatoes, particularly under warm conditions which favour rapid breeding. Carriage by wind appears to be the chief method of tomato mite dispersal.

Control.

Mites are among the simplest of tomato pests to control by the use of dusts or sprays but, even so, it is desirable to reduce the risk of crop infestation from outside sources to a minimum. Old tomato plants can be a source of such infestation and they should therefore be destroyed when fruit picking has ceased. Weeds which harbour the pest should also be eradicated. Furthermore, it is inadvisable to plant tomatoes near crops of English potatoes or on land from which potatoes have just been harvested.

Complete elimination of sources of infestation, however, is seldom possible, and insecticides must often be used in the field for mite control. Ground sulphur, or precipitated or sublimed sulphur, diluted with an equal quantity of fine hydrated lime, may be used, at the rate of 5 to 20 lb. per 1,000 plants, depending upon their size. The proportion of sulphur in tomato dusts which are not used exclusively for mite control should be at least 30 per cent. A spray containing lime sulphur at a strength of $\frac{1}{2}$ gallon of the commercial concentrate to 50 gallons of water, or colloidal sulphur at a strength of 1 lb. to 50 gallons of water is also effective. The amount of spray used will vary with the size of the plants treated, 40 gallons being sufficient for 1,000 plants 1 foot across. Colloidal sulphur may be added to a Bordeaux-arsenate of lead combination spray, but on no account should lime sulphur be added to this mixture.

Tomatoes should be treated from the seedling stage onwards in Central and North Queensland, where the mite is particularly important. Sulphur applications should be made once a fortnight, except in mid-winter, when monthly applications are normally adequate. Treatment once a month is usually sufficient in southern Queensland; if, however, losses have been experienced in the previous season, more frequent dust or spray applications are desirable.

JASSID.

Numerous small white dots on the older leaves are the first symptom of jassid attack. As injury increases these dots merge to form larger patches embracing the greater part of each infested leaf, which then curls up and later dies prematurely. Leaf curl may be pronounced in young leaves, but the white spotting is less distinct in them than in the older foliage. Foliage loss begins at the base of the plant and progresses along the stems in a manner similar to that observed in mite injury, but a careful check of the stem and leaf symptoms will prevent any confusion as to the cause of the trouble. The fruit may be attacked, white spots of dead tissue appearing on the skin which is also blemished by dark stains of excreta.

Life History and Habits.

The tomato jassid* is a small, green insect about $\frac{1}{6}$ inch in length, possessing wings and sucking mouth parts (Plate 14). It is capable of only limited flight. On shaking an infested bush, a swarm of the winged insects will emerge momentarily. The females lay their elongate-oval eggs within the tissue of the younger parts of the stem and in the leaf petioles. From these emerge the young jassids, which are very similar in appearance to the adults, save that they are smaller and wingless. Like the adults, they usually remain on the undersurfaces of the leaves, where they frequently move with a characteristic side-ways motion. As they grow they moult several times. During autumn the eggs hatch in ten to twelve days, the young reaching the adult stage in a further two to three weeks. This rate of development enables jassid populations to increase rapidly under favourable conditions.

Plate 14.
TOMATO JASSID × 15.
[*Drawing by William Manley.*

Jassids are particularly important in some parts of North Queensland, where populations are highest in the late winter and early spring months, most crops then having reached their peak picking period. They are especially abundant after a dry autumn and winter. Young crops planted for late picking soon become infested from old fields, and their commercial bearing period ends prematurely. The tomato jassid lives on several other plants, including the eggfruit and the potato.

Control.

Injury is generally not severe on well-grown crops, whereas if growth is checked the pest is particularly destructive; every attention therefore should be given to the maintenance of good growing conditions throughout the season. Late crops should be planted as far away from early crops as possible in order to lessen the danger of cross-infestation. Weekly applications of a 5 per cent. nicotine dust during the warm hours of the day will check this pest, but usually such treatment is too expensive for general use.

* *Empoasca terra-reginae* Paoli.

Recent experimental work indicates that, when suitable preparations are available, the tomato jassid may be controlled by a 0·1 per cent. D.D.T. spray or a 1 per cent. D.D.T. dust applied at intervals of two or three weeks.

APHID.

Sometimes during cool, cloudy weather, aphids* appear under the leaves of tomatoes, and cluster in colonies on the flowers and young leafy growth. Severe attacks are not uncommon in spring crops grown in southern Queensland, where they induce curling of the leaves, distortion or death of the shoots, and blossom-fall.

1 2

Plate 15.

Tomato Aphid.—Winged and wingless forms × 7.

[*Drawings by William Manley.*

Life History and Habits.

The green, slow-moving aphids on tomatoes are larger than those encountered on many other plants. They suck the sap by means of piercing mouth parts, and can carry and spread virus diseases. The colonies consist of winged and wingless individuals (Plate 15), the relative proportions of which vary with the season. Winged forms can migrate from plant to plant and from field to field and thus found new colonies. Ants are sometimes in attendance on these insects, and their activity thus indicates the presence of the aphids.

Control.

The tomato aphid can be controlled by one or more applications of nicotine dusts or sprays. Applications of a 3 per cent. nicotine dust are adequate for normal requirements and a nicotine sulphate spray may be prepared with the following formula:—½ pint of nicotine sulphate, 2 lb. of soft soap, and 50 gallons of water.

LEAF-EATING LOOPER.

Tomato foliage and fruit (Plate 16) may be eaten by the leaf-eating looper,† whose green caterpillars grow to 1½ inches in length and move with a looping motion. When full-grown, these caterpillars pupate

* *Macrosiphum solanifolii* Ashm.

† *Plusia argentifera* Gn.

and later, moths with a wing spread of slightly over 1¼ inches emerge from the pupae. Their fore-wings are variegated brown in colour, with two prominent, silvery patches in the centre of each, while the hind-wings are smoky-coloured.

Plate 16.
FRUIT ATTACKED BY LEAF-EATING LOOPER.

Control.

Injury by the leaf-eating looper is rarely of importance, except in seed-beds, and, in these, arsenate of lead dusts or sprays can be applied to control the pest.

CORN EAR WORM.

The corn ear worm* is the most destructive pest of tomatoes in Queensland and is by no means easy to control. Though fruit injury is particularly obvious, blossom damage can also be serious. The caterpillars of this pest injure the fruit by piercing the skin and feeding on the fleshy contents (Plate 17). The entrance holes in the fruit vary in size, being sometimes quite large, though occasionally the small caterpillars enter half-grown fruit and only emerge, when full-grown, to pupate in the soil. Unless carefully examined, fruit infested in this way is not detected when packed, and the caterpillars may later eat their way out and attack other fruit in the case. Secondary rots follow, and the

* *Heliothis armigera* Hbn.

fruit may have to be picked over before sale, or discarded altogether. In the field, soft rots usually infect injured fruit, and the flesh inside deteriorates to a watery, slimy consistency. Occasionally, the surface injuries on green tomatoes heal, and the fruit merely shows a superficial blemish. Blossom damage is caused by the feeding of young caterpillars emerging from eggs laid on or near the flowers. These caterpillars may also feed to a limited extent on the foliage, or may make short tunnels in the stems, but such types of injury are of little significance.

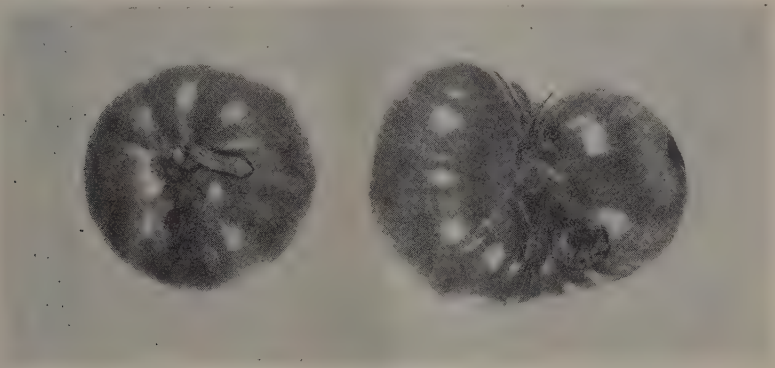


Plate 17.
CORN EAR WORM INFESTATION ON TOMATOES.

Life History and Habits.

The moths (Plate 18) are stoutly-built, inconspicuously-coloured insects with a wingspread of about 1½ inches. Their fore-wings are greyish-green, often tinted with red, and their hind-wings are creamy-yellow, with the veins and a broad marginal band smoky-coloured. The moths lay their eggs on all parts of the plant at dusk and remain

Plate 18.
CORN EAR WORM MOTH × 1½.
[*Drawing by I. W. Helmsing.*

concealed among the plants during the day. A female moth may lay as many as 1,000 eggs in the course of her lifetime. These eggs are laid in considerable numbers on the growing tips and flower clusters from the commencement of blossoming until the period of peak fruit bearing. On seedlings and old plants, eggs are laid much less freely.

The dome-shaped eggs are cream-coloured when newly laid, and are about one-sixtieth of an inch in diameter. After an incubation

period of three to six days, small, white-bodied larvae emerge which, when full-grown, are about 1½ inches in length and variable in colour, with shades of green, brown, yellow, and red interspersed with black markings. One shade usually predominates, and along each side of the larval body there is a yellowish-white band. The larval stage lasts from twelve to twenty-one days in warm weather. When full-grown, the caterpillars leave the plant and construct earthen cells in the soil, inside which they change into dark-brown, smooth pupae, about ¾ inch in length. During summer, the moths emerge from the pupae ten to fourteen days after pupation has taken place. The general appearance of the eggs, larvae, and pupae of the corn ear worm is not unlike that of the corresponding stages of the brown cutworm illustrated in Plate 9.

The corn ear worm feeds on numerous crops and weeds. Apart from tomatoes, crops attacked include maize, sorghum, lucerne, cotton, tobacco, and many vegetables and flowers. The most important weed hosts are gooseberries and pigweeds.

Control.

Proper preparation of the land, weed control, and the destruction of infested fruit, all help to check this pest, but these measures are seldom sufficient to prevent the infestation of tomato crops in coastal areas. Hence, they must normally be supplemented by applications of insecticides.

The most efficient of the available insecticides is arsenate of lead, which can be used either as a dust or a spray. Dusts are slightly superior to sprays which, though less expensive, are not so suitable for use on the larger areas of tomatoes. The arsenate of lead dust should be diluted with an equal quantity of fine hydrated lime, or some other filler, before use. It is frequently necessary to control both corn ear worm and tomato mite at the same time, and a composite dust containing five parts of arsenate of lead, four parts of sulphur, and one part of filler by weight, is suitable for this purpose. If copper has to be included in the dust for disease control, a mixture containing 10 parts of arsenate of lead, six parts of sulphur, and four parts of copper carbonate by weight, will give satisfactory results. Where spraying is preferred, arsenate of lead may be used at the rate of 1½ to 3 lb. per 50 gallons of water. Arsenate of lead may be added to a Bordeaux or a Bordeaux–colloidal sulphur mixture to form a combination spray for pest and disease control.

Corn ear worm is not an easy pest to control and good results can be achieved only by strict adherence to an insecticidal treatment schedule, especially on tomato crops which will blossom and fruit during a period of the year when severe losses from this pest may be anticipated. Correct handling of the seed-beds will ensure that seedlings are pest-free when planted in the field, and this should be the first objective to be aimed at in tomato pest control. That having been achieved, field treatment for corn ear worm control should commence when the first flower cluster appears on the plants.

Thereafter the frequency of application will depend upon corn ear worm activity and on the rate of growth of the plants. Treatment at two-weekly intervals will suffice to control the pest on both rain-grown crops and irrigated crops when corn ear worm is not common. However, if the pest is very active and the plants are growing rapidly,

applications of arsenate of lead should be made every four days to keep the pest at a reasonably low level. Because of the ease and quickness with which dusts can be applied, particularly with power dusters, dusts are preferred to sprays in a schedule which requires short time intervals between applications. If foliage diseases are also a problem, then consideration should be given to making every alternate application a combination spray, since copper sprays have given better results than dusts in checking target spot and other diseases. Should rain wash the insecticide off the plants within three days of its application, treatment should be repeated. With respect to the rate of application it will be found that, for 1,000 plants two to three feet across, 20 lb. of dust or 120 gallons of spray is sufficient. Eggs are laid on all parts of the plant but especially on the young shoots with their developing flower clusters and, in applying insecticides, these parts should therefore receive particular attention. Complete control of corn ear worm on tomatoes is seldom obtained but the increased returns of marketable fruit obtained by the correct use of insecticides will amply recompense the grower for the cost of the labour and materials involved. The recommendations which have just been discussed deal solely with the control of the corn ear worm. It generally happens, however, that it is necessary to establish control over a variety of pests and diseases on a tomato crop. When that is the case, it is essential to adopt a dusting or spraying schedule which will give the maximum amount of control of the common pests and diseases, and not necessarily of corn ear worm alone. Such schedules are discussed in the concluding paragraphs of this article.

Removal of Dust or Spray Residues.

When marketed, tomatoes must not carry arsenical deposits in excess of ·01 grains of arsenic trioxide per pound of fruit. Ordinarily, the grower wipes his fruit to remove dirt and stains before marketing. This procedure, however, is not particularly efficient in removing spray and dust residues which tend to lodge in cracks and furrows on the surface of the fruit.

Chemical treatment is much more efficient, and is therefore sometimes adopted. This entails the use first of an acid solution and then an alkaline solution for neutralising any acid left on the fruit. The acid dip consists of 1 gallon of commercial hydrochloric acid mixed with 99 gallons of water. The alkaline dip is prepared by adding 2½ lb. of hydrated lime to 100 gallons of water. The containers used to hold the solutions should be large enough to allow easy manipulation of a suitable wooden case within them, and should be equipped with inclined draining boards. The tomatoes are placed in the wooden case—which should have the boards spaced sufficiently far apart to allow rapid penetration of the solution and quick draining—and are immersed in the acid dip for one and a-half minutes, the case being moved up and down in order to wet all the fruit. The case is withdrawn at the end of the acid dipping period, allowed to drain on the draining boards for a few minutes, and is then plunged into the lime dip for a minute. After removal from this dip, the tomatoes are again drained, well sluiced with clean water, and set aside to dry thoroughly before packing.

Eight gallons of the acid dip are sufficient to treat at least 12 bushels of tomatoes carrying heavy spray residues. Sound and scarred tomatoes, whether coloured or green, are not injured by this treatment, nor is cracked fruit affected, provided it is dried quickly after the dipping process.

POTATO TUBER MOTH.

Plate 19.
POTATO TUBER MOTH.—Tomato stem infested by potato tuber moth larvae.

The potato tuber moth* attacks all parts of the tomato plant; fruit injury, due to the larvae entering at the stem end where they tunnel into the core, and infestation of the tips of the stems of young plants are particularly important. The larvae may also penetrate the fruit where adjacent fruits are in contact or through scars caused by hail, rubbing, or spray burn. Often a web is spun across the entrance hole, making detection of fruit injury difficult during picking, particularly when the caterpillars have entered at the stem end. One or more caterpillars may be found in each infested fruit and, if injured fruits do not decay, they ripen prematurely. Leaves and young shoots may also be attacked severely, typical symptoms being leaf mining and the collapse of young lateral branches (Plate 19).

Life History and Habits.

The adult moth (Plate 20; fig. 2) is an insignificant, greyish-brown insect with a wingspread of just over $\frac{1}{2}$ inch. The very small, oval eggs (Plate 20; fig. 1) are laid at night on all parts of the plant. The full-grown caterpillar is slightly less than $\frac{1}{2}$ inch in length, and is dull white, tinged with green (Plate 20; fig. 3). Pupation takes place in white silken cocoons on the plant, in rubbish on the surface of the soil or in crevices around the packing shed. The pupa (Plate 20; fig. 4) is dark-brown and $\frac{1}{3}$ inch in length. The life cycle from egg to moth is completed in about one month in warm weather.

Attacks are most severe during long periods of dry weather, and may continue throughout the entire bearing period of the crop. This pest attacks several other plants, including English potato, tobacco, egg fruit, and Cape gooseberry.

Control.

If potato tuber moth is known to be present in the crop, great care must be exercised when packing to ensure the culling of infested fruit,

* *Gnorimoschema operculella* Zell.

which should be destroyed. Similar action should be taken in the field and residues should be removed and burned as soon as harvesting has been completed. Tomatoes should not be planted on old potato land nor should they be grown near English potatoes, especially if the latter crop is to be harvested before the main tomato picking period. Insecticides are seldom applied solely for the control of this pest; the dusting or spraying programme adopted for corn ear worm control, however, assists in keeping the insect in check. It is possible that a 0·1 per cent. D.D.T. spray will be useful in controlling the potato tuber moth when the material becomes available for agricultural use.

Plate 20.

Potato Tuber Moth.—Fig. 1: Egg × 25. Fig. 2: Adult × 5. Fig. 3: Larva × 7. Fig. 4: Pupa × 7.

[*Drawings by William Manley.*

ROT FLIES AND FRUIT FLIES.

Fly maggots are commonly found in rotting tomatoes. These are usually the immature stages of secondary rot flies though the true fruit flies are sometimes involved. These secondary rot flies include a small, metallic-green species,* a small, reddish-brown species,† and several species of grey, hairy flies.‡ In general, the females of these flies lay

* *Lonchaea aurea* Macq.

† *Drosophila* sp.

‡ Fam. Muscidae. Fam. Sarcophagidae.

eggs or maggots in cracks, blemishes, or other places where the skin of the fruit has been broken. The full-grown maggots are dull white or cream coloured, and live for some days in rotting fruit before pupating in reddish-brown pupal cases in the soil.

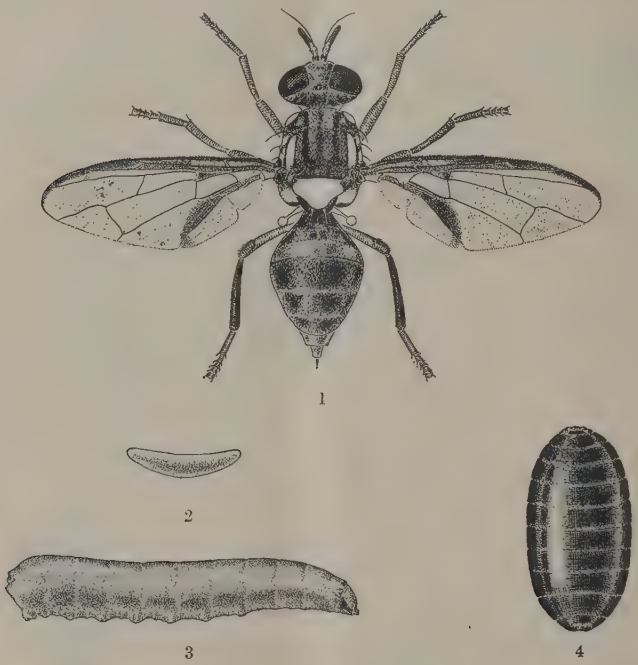


Plate 21.
QUEENSLAND FRUIT FLY.
Fig. 1.—Adult × 7. Fig. 2.—Egg × 16. Fig. 3.—Larva × 7.
Fig. 4.—Pupal case × 7.
[*Drawings by William Manley.*

Three species of fruit fly may attack tomato fruits. Two of these, the Queensland fruit fly* (Plate 21), and the Solanum fly†, sting sound fruit. A third, the cucumber fruit fly‡, lays its eggs only in fruit which is already blemished by growth cracks, disease lesions, or wind injuries. Normally, the fruit flies are of little or no importance to tomato growers but, in some years when these pests are very active, tomatoes may suffer severely.

Control.

Insecticides are of no value for the control of the secondary rot flies. These insects only accelerate the normal process of decay, and, when losses do occur, cultural methods should be examined to eliminate, as far as is practicable, the fruit-cracking which predisposes fruit to

* *Strumeta tryoni* Frogg.
† *Strumeta dorsalis* Hend.
‡ *Austrodacus cucumis*, Fr.

attack. When the true fruit flies are involved, the losses may be minimised by applying a bait spray to some of the plants. Suitable bait sprays can be prepared from either of the following formulae:— 1 oz. of sodium fluosilicate, 2 lb. of sugar, 4 gallons of water; or 2½ oz. of arsenate of lead, 2 lb. of sugar, 4 gallons of water. A proprietary bait spray which merely requires the addition of water before use is also marketed in Queensland. One or other of these bait sprays should be applied to about every tenth plant through a coarse jet spray, and should be repeated at six-day intervals while the fruit flies are numerous.

GREEN VEGETABLE BUG AND OTHER SHIELD BUGS.

The shield bugs which attack tomatoes include the green vegetable bug* and two smaller insects, the main injury inflicted by these species being to the fruit. Both the adults and the immature stages of these bugs possess piercing mouth parts through which the sap is sucked from the plant tissues. Damaged fruit is mottled and blemished by a number of light coloured spots, each of which represents a bug puncture and extends through the skin and the outer rim of the flesh. The injured fruit fails to colour evenly, and is unpalatable and frequently unmarketable, owing to its abnormal shape and texture.

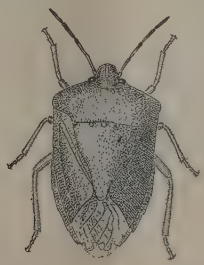


Plate 22.
Green Vegetable Bug—Adult × 2.

[*Drawing by William Manley.*

The adult green vegetable bug (Plate 22) measures ½ inch in length by ⅓ inch in breadth, and is green in warm weather but dark brownish-grey in winter. The female lays small, cylindrical, cup-shaped eggs (Plate 23) on the under surface of the leaves, in batches of 20 to 150. These eggs are at first pale-yellow in colour but they acquire a pinkish tinge before hatching. The incubation period is less than a week, and the small, newly-emerged bugs are wingless and bright orange-brown in colour. They remain near the egg shells for a few days and then gradually scatter over the plant, but are particularly attracted to the fruit. In a few days the young bugs become marked with black, yellow, and red colour patterns which are superseded by green in the later stages of development. After moulting several times the bugs reach the adult stage.

Both the smaller shield bugs are $^{3}/_{10}$ inch in length and about ⅕ inch in breadth and have a life history similar to that of the green vegetable

* *Nezara viridula* L.

bug. One species* is uniformly green with a small horn on each side of the front part of the shield. In the other,† the horns are absent, the head, thorax, and the backwardly-pointing, wedge-shaped part of the shield are green, while the rest of the body is brown with a greenish tinge.

Plate 23.
GREEN VEGETABLE BUG.—Egg clusters on tomato foliage. Natural Size.

Control.

Some benefit may be obtained if any unparasitised egg masses, immature bugs, and adults seen during fruit picking are crushed by hand. If the eggs are grey in colour they are invariably parasitised and should not be destroyed.

The pest is difficult to control, particularly in large, leafy, untrellised vines, where the bugs cluster on fruit which is well sheltered and protected by foliage. A spray composed of 10 lb. of resin, 2 lb. of caustic soda, 3 lb. of fish oil, and 40 gallons of water has given fair results against young bugs‡. The caustic soda is dissolved in 2 gallons of water and quietly boiled. The finely-ground resin is stirred slowly into this, and the boiling continued until the solution under the surface scum, though dark, is clear. The fish oil is added, and the mixture boiled for a few more minutes. This concentrate is diluted with 38 gallons of water before use. The concentrate containing fish oil does not store well. Hence, if storage is necessary, a concentrate without fish oil should be prepared. After reheating add the oil, boil for a few minutes, and then the spray is ready for dilution and immediate use.

* *Cuspicona simplex* Walk.

† *Plautia affinis* Dall.

‡ Resin, fish oil, and 5 per cent. nicotine dusts are unprocurable at the time of writing, but it is hoped that they will again be available at no distant date.

A derris spray containing 0·02 per cent. ether extractives prepared from powdered derris-soap or liquid derris proprietary products is also of some value against the immature bugs, this concentration being about twice as great as that used for the control of thrips. Weekly applications of a dust containing 5 per cent. nicotine will kill some of the young bugs, and exert a deterrent effect against the adults, but as the dust needs to be applied liberally and frequently, its use is costly.

Good kills of the green vegetable bug have been obtained with a 0·2 per cent. D.D.T. spray and a 2 per cent. D.D.T. dust in recent field experiments. It seems probable, therefore, that this insecticide will provide a satisfactory solution to the problem of controlling the pest when suitable materials are available.

1

2

3

4

Plate 24.

RUTHERGLEN BUG.

Fig. 1.—Egg × 18. Fig. 2.—Immature bug × 20. Fig. 3.—Adult female, dorsal view × 6. Fig. 4.—Adult female, ventral view × 6.

[Drawings by I. W. Helmsing.

RUTHERGLEN BUG.

Rutherglen bug* injury is confined mainly to the fruit, though all parts of the plant may suffer when the infestation is heavy. The blemishes resulting from attacks by this insect are similar to those caused by shield bugs.

The adult is a greyish-brown, slender, winged insect, about $\frac{1}{6}$ inch in length, possessing sucking mouth parts (Plate 24). It flies actively on warm days when disturbed. Its eggs are small, elongate, and white when newly-laid, and are commonly found in the hairy seed heads of thistles and rag-weeds, and around the buds and flowers of red pigweed.

* *Nysius vinitor* Berg.

The eggs hatch in about six days in warm weather, the wingless, reddish-brown nymphs reaching the adult stage in a further three weeks. Rutherglen bugs on tomatoes consist of invading swarms of adults and only occasionally of the immature stages, since the bug does not breed on this crop.

The Rutherglen bug infests many crops other than tomatoes. Attacks by it are likely when dry weather follows late winter or early spring rains, which favour the growth of weeds. Heavy rains, which stimulate fresh weed growth, often scatter large swarms of this pest.

Control.

Constant control of weeds within and around cultivated fields should be maintained as far as is practicable. Bugs on infested weeds may be destroyed by spraying with crude oil emulsion or kerosene emulsion at a strength of one part to eight parts of water. Temporary relief may be given to an infested field by lighting smoke fires.

Control by insecticides is not satisfactory, because the bugs fly quickly, and many escape contact with sprays or dusts. However, either a dust mixture containing equal quantities of pyrethrum and a 3 per cent. nicotine dust or a spray prepared from 3 lb. of pyrethrum powder, 2 lb. of soft soap, and 50 gallons of water, used immediately after preparation, may give some measure of relief if several applications are made when the bugs are numerous.

THRIPS.

Blossom-fall in tomatoes may be due to a number of factors, but in North Queensland high thrips* populations are a probable cause of faulty fruit setting, particularly in dry weather. These thrips are very small, active, cream-coloured insects, measuring about $\frac{1}{16}$ inch in length and they cluster inside the flowers, which subsequently fall. Fruit developing after such outbreaks is frequently malformed.

Control.

If high thrips populations are observed in the tomato flowers and flower drop, with or without fruit malformation, has previously been reported on the farm, it is suggested that a 5 per cent. nicotine dust be used. More than one application may be necessary to check the pest.

MIRID.

The immature stages and the adults of a small plant bug† measuring about $\frac{1}{8}$ inch in length are often found on the growing shoots of tomatoes and sometimes are very numerous. The adult has long legs, is active in its movements, and is patterned with light- and dark-green markings (Plate 25). Its eggs are laid in the plant tissue and the light-green bugs which emerge from them are shaped like the adults but they are smaller and have no wings. The exact effect of their feeding on tomato shoots has not yet been determined but they are believed to be responsible for malformations in which a part of the stem is

* *Frankliniella* sp.

† *Cyrtopeltis tennis* Reut.

swollen and distorted as if the terminal growth had been temporarily suppressed a few weeks earlier when growing conditions were good. After the monsoonal rains in coastal central Queensland, the pest is very numerous on crops which have been planted in mid to late summer and are trellised or staked.

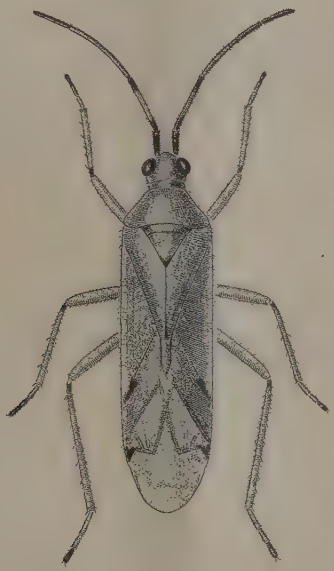


Plate 25.
Adult Mirid × 12.
[*Drawing by William Manley.*

Control.

Applications of a 3 per cent. nicotine dust give a reasonable degree of control but they should commence before the plant terminals are severely injured.

ROUTINE PEST CONTROL MEASURES.

The thorough cultural operations which are essential for the successful growth of the tomato crop also reduce the risks of pest infestation. In this connection the following points are important:—

1. Only healthy seedlings, with roots free from nematode galls, should be used as planting material.
2. Good growing conditions should be maintained in the field by frequent cultivation both before and after transplanting, by the use of fertilizers, and by judicious watering when irrigation facilities are available.
3. All damaged fruit should be collected and destroyed.
4. Care should be exercised in packing tomatoes in order to avoid the inclusion of fruit infested with pests which may later be the means of spoiling the remainder of the case.

5. Old tomato plants should be ploughed out immediately after picking has ceased and burned if they are infested with nematodes.

6. In the crop rotation, tomatoes should not be planted after or near crops, such as potatoes or tobacco, which are subject to attacks by tomato pests.

Growers are seldom faced with a simple problem such as the control of a single pest. For economy in labour and material, therefore, a basic programme which will control pests likely to occur in the crop must be adopted, reserving applications of special insecticides for special problems. The requirements of disease control must also be considered. Combined insecticidal and fungicidal treatments are required in the seed bed and the field.

In the seed-bed, light but frequent applications of a dust containing 5 parts of arsenate of lead, 6 parts of sulphur, 3 parts of copper carbonate, and 6 parts of filler by weight will ensure seedling growth free from most pests and diseases. A proprietary dust of this kind would carry the following analysis:—7·75 per cent. arsenic pentoxide ($As_2 O_5$) as arsenate of lead; 30 per cent. sulphur as ground (or precipitated or sublimed) sulphur; 7·5 per cent. copper (Cu) as copper carbonate. A combination spray consisting of 2-3-40 Bordeaux (or 1 in 20 home-made cuprous oxide mixture) with colloidal sulphur (1 lb. to 50 gallons) and arsenate of lead (1 lb. to 50 gallons) will achieve the same purpose. If aphids appear, they should be treated with a 3 per cent. nicotine dust or a nicotine spray ($\frac{1}{2}$ pint of nicotine sulphate, 2 lb. of soap, and 50 gallons of water).

In the field, an all-purpose dust mixture should contain 10 parts of arsenate of lead, 6 parts of sulphur, and 4 parts of copper carbonate. Such a proprietary dust would carry the following analysis:—15·5 per cent. arsenic pentoxide ($As_2 O_5$) as arsenate of lead; 30 per cent. sulphur as ground (or precipitated or sublimed) sulphur; 10 per cent. copper (Cu) as copper carbonate. If desired, a combination spray of 4-4-40 Bordeaux (or 1 in 10 home-made cuprous oxide mixture), with $1\frac{1}{2}$ to 3 lb. of arsenate of lead and 1 lb. of colloidal sulphur in each 50 gallons of the spray may be used. A nicotine dust or a nicotine sulphate spray similar to that used in the seed-bed should be applied if aphids become numerous. Treatment in the field should commence when flowering begins and continue at approximately seven to ten day intervals at least until picking tallies are at their maximum. Such a schedule, in addition to dealing with other pests and diseases, should give a reasonable measure of control of the corn ear worm. However, should this pest be unusually troublesome, it may be necessary to make a special application of arsenate of lead alone, between routine applications of the combination dust or spray.

Mixed dusts containing insecticides and fungicides in similar proportions to those stated in the recommended formulae are prepared by several firms. Although mixing on the farm cheapens the cost, it is preferable for the grower to purchase dust mixtures already prepared, unless he has facilities for accurately weighing the ingredients and thoroughly mixing them.

PRECAUTIONS.

Arsenic pentoxide, arsenate of lead, and nicotine are all poisons and care must be used in handling and storing them. In order to lessen the risk of injury to the skin, the hands are smeared with grease before grasshopper baits are prepared and thoroughly washed later when they have been distributed in the field. Dust masks give reasonably good protection to the operator applying insecticidal dusts. Smoking should not be attempted for the fumes given off by tobacco contaminated with arsenicals can be harmful to the smoker. Insecticides should be stored in locked cupboards where unauthorised persons will not have access to them.

ANSWERS.

Selections from the outward mail of the Government Botanist.

Crows-foot Grass.

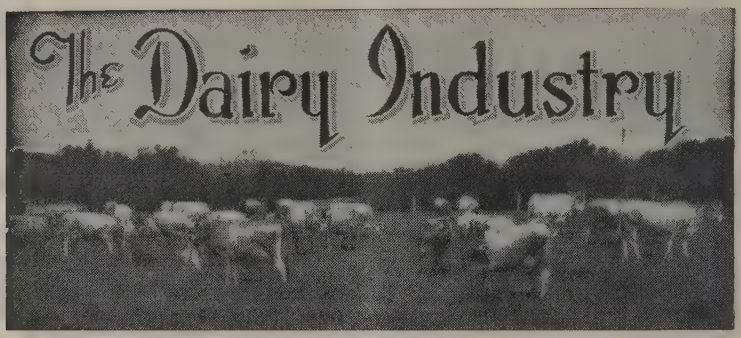
W.C.M. (Barcaldine)—

Both specimens represent *Eleusine indica*, Crows-foot Grass. This grass is very widely spread over the warmer regions of the world. It is very common in coastal Queensland and generally occurs as a weed of cultivation areas, around cow-yards and along railway embankments; in fact, anywhere where the ground has been disturbed. It is not usually seen as a constituent of the ordinary pasture. It is a robust grass growing rapidly during the summer months. It is sometimes called Holdfast Grass because of its tenacious hold on the ground. It is fairly palatable, but like some of the sorghums it contains a prussic-acid yielding glucoside. Very little trouble, however, is experienced with it in Queensland, but hungry or empty stock should not be allowed to gorge themselves on it. This grass is frequently received from western properties, where it has mostly come up either in the garden or in cultivation.

Gomphrena Weed.

L.F.D. (Chinchilla)—

The specimen is the Gomphrena Weed (*Gomphrena decumbens*), a native of tropical America, now widely spread in Queensland. It was introduced here about twenty years ago about Townsville. Since then it has spread to the southern parts of the State and some considerable distance inland. It belongs to a wholesome family of plants the Amaranths, and is not known to possess any poisonous or harmful properties. Stock have not been seen to eat it to any extent, even when other feed is scarce. It seems to thrive in waste places about towns and has not spread into cultivation areas as a serious pest to any extent.



Milk and Cream Grading.

E. B. RICE, Director of Dairying.

GRADING and payment according to quality is generally recognised as a factor of great importance in the maintenance and raising of quality of dairy produce. The Queensland *Dairy Produce Act* prescribes that all cream received at butter factories shall be paid for at differential prices according to its quality. The price prescribed for choice grade cream is ½d. per lb. commercial butter equivalent over that for first-grade cream, while second-grade cream must be paid for at least 1d. per lb. commercial butter less than for first grade. The Act also makes it mandatory for only persons possessing certificates of competency to be employed in the testing and grading of milk and cream.

It is the responsibility of the factory grader to classify correctly each can of cream, for upon this assessment of quality will depend the monetary return received by the farmer for his produce. The factory grader must therefore exercise the utmost care and impartiality in the discharge of his work.

Inefficient or incorrect grading may have serious influences. Butter produced by the blending of inferior cream with cream of sound quality may be degraded when examined officially by State or Commonwealth graders. Is it not unfair to penalise careful suppliers by blending their cream with inferior cream which may cause the resultant butter to be degraded and thus depreciated in value? Because of the disability in the marketing of inferior butter, lenient grading of inefficiently produced cream should not be tolerated.

Another disquieting feature about lenient grading is its effect on the producer who, believing his production methods to be satisfactory (because of satisfactory cream grades), becomes complacent and does not strive to ascertain the cause of and rectify any faults in the care and handling of his cream.

The producer whose cream is degraded may feel aggrieved and be under the impression that his product is being penalised by the factory. Factory operations, and particularly grading and testing, are, however, constantly supervised and checked by Departmental officers. Rather than a too rigid adherence to standards, it is invariably found that

factories are inclined to err on the side of the producer and allow him the benefit of the doubt in the grading of "borderline" cream. Moreover, complete records of each month's operations of all factories are kept in the Department. These records furnish information on (*a*) the quantities of cream paid for in each grade; (*b*) the quantities of butter of each grade made; and (*c*) the official grades of all butter submitted for grading. A careful check is thus kept on the operations of each factory and, in the event of any serious discrepancy between the relationship of the various sets of figures, action is immediately taken. Any producer is at liberty to request a Departmental officer to check the grading and/or testing of his cream or milk.

Cream Characteristics.

Cream should be the product of healthy dairy stock, produced and handled under cleanly methods. Flavour is of foremost importance in assessing the quality of cream, but certain other characteristics, such as aroma, body and texture, and colour are taken into consideration.

Flavour.—The grader should have a keen sense of taste developed and trained by practical dairy factory work, so as to enable him to detect and appreciate the clean full natural flavour of a choice cream. He will discern by tasting the following flavour defects:—unclean, overacid, stale, vinegary, rancid, tallowy, musty, weedy, bitter, metallic, fishy, putrefactive, food and other flavour defects. Cream may absorb oil flavours, especially from milking machines, and from high flavoured products that are stored in proximity to the cream. The cream should be stored in clean sanitary surroundings, and in the presence of pure air.

Aroma.—The full natural flavour and odour of a cream produced and handled under sanitary conditions appeals to the senses of a trained grader. The faculties of smell are called to the grader's aid. The odour of a choice-grade cream appeals to the sense of smell. The grader will note undesirable odours such as an unclean, disagreeable odour found in the produce of the unhealthy cow. Stable or yard odour is detected in cream produced under insanitary conditions such as dirty yards and bails, from which droppings have not been removed regularly. Food odours are associated with cream produced by cows on foods that impart strong flavours to milk and cream, such as green lucerne, turnip, rape and musty foodstuffs. Undesirable odours are also imparted by varieties of weeds which grow in pastures and cultivated areas at certain periods of the year. A strong acid odour is associated with cream in an over-ripe condition.

Body and Texture.—The body of the cream is noted by the grader. Choice-grade cream has an even body with the consistency of well-mixed paint.

Colour.—The grader's sense of sight is used. A choice-grade cream has a bright appearance. An over-ripe cream is dull in colour, due to the bleaching of the natural colour by bacterial action

Legislative Provisions.

Official Grades of Cream for Butter Manufacture.—The relevant portions of *The Dairy Produce Act* are:—

Section 17.—(1) The manager of every factory shall grade or cause to be graded all cream which is supplied to him, and in manufacturing butter therefrom shall keep apart and not blend or mix either as cream or butter the various grades thereof.

(*a*) Cream received at a factory shall be graded as being of choice grade, first grade, or second grade according to the quality of the cream. This shall not prevent the owner of a factory accepting cream below second grade provided that such cream is graded as pastry grade.

Regulation 158.—(1) Choice-grade cream shall be cream capable of being manufactured into butter which will grade as "choice" grade.

(2) First-grade cream shall be cream capable of being manufactured into butter which will grade as "first" grade.

(3) Second-grade cream shall be cream incapable of being manufactured into butter which will grade as "choice" grade or "first" grade.

Regulation 187.—No cream containing more than two-thirds of 1 per centum (0·67 per cent.) of acidity, calculated as lactic acid, shall be classed as of choice or first grade quality by a cream grader at a factory.

The characteristics of cream of the respective grades made be defined as:—

Choice Cream (93 points and over) must have a clean flavour and aroma, either sweet or of a pleasant acid flavour, showing no curd particles and of a smooth, even consistency.

First-grade Cream (90-92 points) comprises cream in a high acid condition but possessing true lactic acid flavour, or a natural flat flavour, and of a smooth, even consistency; also sour or sweet cream with only a slight "off" flavour, and of a smooth, even consistency. Cream which is slightly feed tainted, and which experience teaches will not seriously affect the flavour of the resultant butter, may be placed in this grade.

Second-grade Cream (86-89 points) comprises cream which, in the opinion of the grader, does not possess the qualities or character to enable it to qualify for a higher grade, but is free from putrefaction. In this class would fall cream having objectionable odours and flavour such as weedy, curdy, fermented, gassy, yeasty, metallic, tallowy, and other "off" flavours.

Pastry Cream (83-85 points).—Any cream which cannot be classed in any of the above grades may be classed as pastry, but if putrefactive, or containing any prohibited ingredients such as disinfectants, preservatives, &c., it should be rejected.

Factors in the Deterioration of Milk and Cream.

A deterioration in milk and cream quality may be brought about by the undermentioned causes:—

1. Abnormal milk due to ill-health or disease.
2. Food consumed by the cow.
3. Absorption of odours from surroundings.
4. Bacterial action.
5. Chemical action.
6. Infrequency of delivery.

A leaflet which deals fully with the various defects of milk and cream is obtainable upon inquiry from the Division of Dairying of the Department. However, the chief causes of "off" flavours are summarised below:—

Production.—Undesirable taints may be introduced by:—

1. Failing to keep the cow yards and bails in a clean sanitary condition.
2. Failing to wipe the cow's udder and flank to free it from dust, dirt, and manure; and to wash the teats prior to milking with clean water to which a little hypochlorite or permanganate of potash has been added.
3. Failing to cleanse the hands of the milker, by washing them frequently in clean water, during milking.
4. Failing to change cleansing and washing waters as often as is necessary.
5. Failing to use clean cloths and water in the cleansing of the cow's udder and teats, and milker's hands.
6. Failing to keep the clothing of the milker and attendant in a clean state.
7. Failing to discard the first few squirts of milk from each teat.
8. Failing to keep buckets, strainers, cans, and all utensils and portions of the plant with which the milk or cream comes in contact, in a clean sanitary condition. (This is a most important factor.)

Handling the Milk and Cream.—Defects may be attributable to:—

1. Straining the milk through unclean gauze or cloth strainer.
2. Allowing milk to come in contact with untinned or rusty surfaces of buckets, cans, or utensils.
3. Failing to protect from contamination by specks of dirt, dust, flies, or insects.
4. Skimming cream with too low or too high a fat content. (*See* Regulations under the *Dairy Produce Act.*)
5. Failing to wash and thoroughly cleanse separator and all utensils with which the milk and cream comes in contact each time they are used.
6. Failing to store milk and cream in clean atmosphere, and sanitary surroundings.

Care of Milk and Cream on the Farm.—The quality of milk or cream may be lowered by:—

1. Failing to cool cream from each separating, or to cool milk.
2. Failing to hold in cool, sanitary surroundings.
3. Failing to stir cream frequently with a metal stirrer.
4. Failing to thoroughly blend each separating when mixed, after it is cool.
5. Holding or allowing the milk or cream to come in contact with untinned rusty cans, containers, or utensils.

6. Using containers and utensils having open seams, such as benzine tins, for the storage of milk or cream. The cream can that has a well-tinned surface is a suitable container.
7. Failing to send cream frequently to the factory, at least four times weekly.
8. Failing to protect milk and cream from heat and the direct rays of the sun in transit and in delivery to the factory.

Grading Practice.

The efficient cream grader, through long experience in the practice of grading, should be capable of classifying cream into its correct grade and of indicating the type of defect, if any, and of affording instruction to the producer concerning its causation, and the remedial measures. When the can of cream comes before the grader it and its contents are carefully scrutinised. Cans which are clean outside, not dented or rusty, give presumptive evidence of careful and cleanly practices. Rusty, dented or open-seam cans arouse suspicion by virtue of their unsuitability for holding a perishable product like cream. Upon lifting the lid off the can the trained senses of *smell* and *sight* first survey the contents. The surface portion of the cream is closely examined for particles of dirt, dust, flies, &c., which are indicative of neglect. A hard, tough surface covering points to failure to stir the cream. A frothy or aerated surface leads to the conclusion that separation took place direct into the can or that stirring was neglected. Gassy bubbles furnish evidence of carelessness which resulted in the contamination of the cream in production by means of undesirable coliform bacteria (gas-producing organisms often of manurial origin), or by yeasts which may originate from unclean milking machines, &c. If on plunging the cream stirrer and sampler into the cream a tough layer is encountered within the body of the cream, it may be concluded that the cream was delivered direct into the can on top of the cream from a previous separation without proper blending and failure to stir the cream at intervals on the farm. Hard, tough portions throughout the body of the cream denote failure to mix and stir efficiently. Curdling, or partial churning, may have arisen from separating cream of fat content below the recommended standard, or by allowing warm cream to flow straight from the separator on to cream from a previous separation, or the mixing of warm and cold cream.

As previously explained, the smell is noted as soon as the lid is removed from the can. A glass rod is recommended for sampling for flavour and noting body and texture.

The grader is advised to rinse his mouth with water occasionally in order to assist in maintaining keenness of palate when large numbers of samples have to be graded. Eating an apple is also excellent for this purpose.

Certificate of Competency in Milk and Cream Grading.

For many years the customary examination for candidates in the practice of cream grading was to require them to classify the quality of the produce from a number of suppliers' cans on a factory platform. Some few years ago the system of conducting the practical examination was revised. The main objection to the old system was that a candidate fortunate enough to be examined at his own local factory in which

he had worked for a number of years possessed an advantage over another candidate who was strange to the particular supply and, moreover, the range of samples varied widely according to seasonal, district, and other conditions. In short, the examination could not be standardised. The present system ensures uniformity of examination. A given number of samples (usually 24) is placed out in small tins of about 1 lb. capacity. The candidate is expected to place each sample into its grade and to describe any "off" flavour or other defect (such as ropy, curdy, &c.). In certain instances, such as disinfectant, fishy or chemical flavours, more importance is placed upon correct description than upon actual grade. As many natural samples as are available are selected, but to provide a full range of flavours, grades, and defects likely to be found from time to time amongst factory supplies some of the samples are "doctored"; that is, if desired certain taints may be artificially added to the milk or cream. However, care is always taken to make samples resemble as closely as possible defects which may normally occur. Although a candidate can hardly be expected to correctly classify into grade and describe every defect in the samples submitted to him, credit is given for correct assignment of grade, and for remarks about the sample and its description. The examination actually serves to indicate whether a candidate has trained his palate and would be capable of engaging in the grading of cream at a factory.

For the guidance of prospective candidates for the qualifying examination under the *Dairy Produce Act*, the following list of samples, together with hints on the preparation of artificial samples, has been compiled. For the purpose of gaining proficiency in distinguishing typical flavours and training the sensitivity of the palate, it is suggested that water extracts of many substances could first be prepared. Sufficient of the ingredients should be used to impart a pronounced flavour and, as proficiency is gained, the quantity should be gradually reduced or the water-extract diluted. Actual milk or cream samples, either natural or "doctored," should follow. With training of this nature the candidate should soon be capable of detecting even slight "off" flavours and of correctly distinguishing them.

Milk and Cream Flavours.

Fresh milk
Separated milk
Pasteurised milk
Choice cream
Pasteurised cream
Sour milk

Feed Flavours.—Lucerne, clover, Sudan grass, sorghum, wheat, oats, barley, maize, onion taint, &c. (Immerse materials in slightly warm milk to induce taint.)

Weed Flavours.—Mustard weed, carrot weed, stinking Roger, Hexham scent, pennyroyal, chili weed, turkey weed, lantana, cress, &c. (Immerse weed in milk to induce taint.)

Factory Process Flavours.—Pasteurised cream, neutralised cream, cooked or "stewed" flavours; lime flavour.

Cleanser Flavours, &c.—Use washing soda, soda bicarbonate (baking soda), soap.

Steriliser Taints, &c.—Chlorine (use commercial chlorine compounds).

Disinfectant Flavours, &c.—Use carbolic, kerosene, coal tar, &c.

Absorbed Flavours.—Smoky, kerosene, benzine, oil fumes, "oily."

Preservatives.—Use saltpetre, boric acid, borax, formalin.

Metallic Taints.—Iron, copper.

Fishy Flavour.—Use sardines or codliver oil to prepare.

Tallowy.—Expose to sunlight or hold in copper vessel.

Bacteriological Defects.—Only natural samples can be used for practice as they cannot be simulated or prepared under factory conditions. Cheesy, fermented, curdy, slimy, ropy, gassy, "unclean," yeasty, fruity, albuminous, over-ripe, cowy, musty, stalish, bitter (use quinine).

Abnormal Milk or Cream.—Colostrum; late lactation milk (salty), mastitis milk, &c.

Milk Grading.

The relevant portions of the Act are:—

Section 17 (b).—Milk received at a factory shall be graded as being of first grade or second grade according to the quality of the milk.

Regulation 186.—No milk containing more than one-fourth of 1 per centum (0·25 per cent.) of acidity, calculated as lactic acid, shall be classified as first grade quality by a milk grader at a factory.

The causes affecting the quality of milk, and consequently a knowledge of the following is essential:—

1. Elementary knowledge of dairy bacteria, their development and their influence on milk.
2. The influence of temperature on milk.
3. The influence of feeds on milk.
4. The influence of water on milk.
5. The influence of surroundings on milk.
6. The influence of aeration and straining of milk.
7. The influence of cow's health on milk.
8. The proper care in the cleansing of dairy utensils.

The leaflet "Factors affecting the quality of milk for cheese manufacture" deals with the influence of the above factors.

Furthermore, the candidate should know:—

(*a*) How to advise farmers on the probable causes of low-grade milk and the remedy;

(*b*) How to operate various tests such as the Methylene Blue (or Reductase) Test, Fermentation Test, Winconsin Curd Test, and Sediment Test. The pamphlet entitled "Milk Grading Tests" deals with these tests.

(*c*) The Queensland *Dairy Produce Act and Regulations* as applied to milk.

The milk grader should be able to advise the farmer on all the foregoing and thereby render assistance by being able to instruct him as to the probable causes of defects in his milk supply and the best method of removing such defects. To do this the grader must of necessity be able to operate certain tests as apply to milk to determine the quality. The most common in use in Queensland are the Methylene Blue Test, the Fermentation Test, the Wisconsin Curd Test, and the Sediment Test.

Last but by no means least, the milk grader must be conversant with the *Dairy Produce Act and the Regulations* which govern the production, treatment, distribution, and care of milk.

In practical milk grading the following points should be observed:-

As the sense of smell is more reliable than palate in grading milk, the grader should not fail to smell the milk, the aroma of which should be pleasant. If otherwise, he must endeavour to decide if the off-flavour is a matter of feeds or bacterial contamination and the palate will generally assist him in his decision.

The grader should note if the cans containing the milk are well tinned and clean, if the milk has been carried in a clean vehicle and has been protected by a satisfactory cover from the rays of the sun and dust during transit.

The temperature should be taken regularly upon delivery to ascertain if the milk has been aerated and cooled. Sediment tests will decide its freedom from foreign matter, thus proving the use or otherwise of cotton wads in straining as required by the *Dairy Produce Act*. In the case of doubt as to the acidity of milk, the milk should be tested for acidity. Should the acidity be over 25 per cent. the milk is classed as second grade. Frequent acidity testing of milk on the factory platform in warm weather is useful as a guidance to producers, but regular testing by the methylene blue test is preferable. Tentative standards suggested for the grading of milk by the methylene blue test for cheese manufacture are:—

Morning's milk shall not decolourise methylene blue in less than five and a-half hours.

Evening's milk (tested the ensuing morning on arrival at factory) —two hours.

Mixed (night and morning) milk—three hours.

The testing of the mixed milk after tipping into the factory weigh vat facilitates sampling and grading. The adoption of varying standards in the winter and summer months for the mixed milk might be advisable under Queensland conditions. Suggested tentative standards are:— Summer months, two hours; winter months, three hours.

If the milk be delivered to a cheese factory, the time of delivery should be noted, as the Dairy Produce Regulations require milk to be delivered to such factories not later than 9 a.m. during summer and 9.30 a.m. during winter.

PRODUCTION RECORDING.

List of cows and heifers, officially tested by Officers of the Department of Agriculture and Stock, which qualified for entry into the Advanced Register of the Herd Books of the A.I.S., Jersey, Guernsey, and Ayrshire Societies production records for which have been compiled during the month of April, 1945 (273 days' production unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.).				
Rhodesview Royal Primrose	Gierke and Sons, Helidon	7·585·8	378·384	Alfa Vale Monsieur
SENIOR, 4 YEARS (STANDARD 330 LB.).				
Rhodesview Royal Primrose 2nd	Gierke and Sons, Helidon	9,498·65	411·424	Fairvale Major
Yarranvale Socks (248 days)	W. Henschell, Yarranlea	7,897·55	334·438	Trevor Hill Bosca
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Jamberoo Winnie 4th	J. Phillips, Wondai	14,702·9	573·831	Valiant of Greyleigh
Ardilea Nessie 6th	W. Hinrichsen, Clifton	8,365·	349·849	Newstead Reliance
JUNIOR, 3 YEARS (STANDARD 270 LB.).				
Bingleighs Molly 4th	J. C. Meier, Mount Mort	9,796·85	388·340	Blacklands Emblem
Fairlie Cherry 15th	W. Hinrichsen, Clifton	7,392·5	295·972	Fairlie Senator
Rosemount Rose 9th	A. Lohse, Degilbo	6,279·8	284·292	Rosemount Jupiter
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Alfa Vale Star 11th	W. H. Thompson, Nanango	10,275·9	421·437	Penrhos Pansy's Pride
Silver Glen Damsel	V. R. Nugent, Murgon	8,680·25	322·221	Aynsley Victory
Penhros Handsome 17th	A. Webster, Helidon	7,477·65	283·312	Penrhos Pansy's Pride
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Happy Valley Precious	R. R. Radel, Coalstoun Lakes	8,237·71	344·776	Sunnyview Warden
Valera Roseleaf 9th	Sullivan Bros., Pittsworth	7 396·2	341·173	Valera Daphne's Prince
Yarranvale Evelyn	W. Henschell, Yarranlea	7,657·86	318·96	Trevor Hill Rosca
Bantry Choice	D. Sullivan, Pittsworth	7,615·89	292·768	Penrhos Blossom's Prince
Bantry Nellie	D. Sullivan, Pittsworth	7,439·07	270·316	Penrhos Blossom's Prince
Yarranvale Carnation	W. Henschell, Yarranlea	6,609·11	263·129	Trevor Hill Bosca
Valera Lila 11th	Sullivan Bros., Pittsworth	5,652·25	251·604	Alfa Vale Pride 2nd
Yarranvale Laura	W. Henschell, Yarranlea	6,629·06	240·828	Trevor Hill Bosca

AYRSHIRE.

SENIOR, 3 YEARS (STANDARD 290 LB.).

Leafmore Hazeldene	J. P. Ruhle, Motley	6,858·9	290·525	Myola Bessemer

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Myola Miss Jane	J. P. Ruhle, Motley	6,941·9	254·667	Myola Jellico
Brooklands Majesty's Belle	N. C. Webb, Beaudesert	8,605·6	435·546	His Majesty of Dalebank

JUNIOR, 4 YEARS (STANDARD 310 LB.).

Bellgarth Fashion 2nd	D. R. Hutton, Cunningham	8,463·	389·87	Trecarne Renown 2nd

SENIOR, 3 YEARS (STANDARD 290 LB.).

Trinity Cute Princess	J. Sinnamon and Sons, Moggill	9,449·94	463·664	Samares Cute Prince 3rd Imp.
Trinity Golden Duchess	J. Sinnamon and Sons, Moggill	6,834·92	309·473	Trinity Royal Sovereign
Brooklands Choice Rose	W. S. Conochie, Sherwood	7,035·4	305·015	Brooklands Choice Peer
Pineview Dinah	W. A. Berderow, Fairney View	5,500·	301·479	Oxford King Gee
Ashview Letty	C. Huey, Sabine	5,934·8	293·346	Lermont Volunteer

SENIOR, 2 YEARS (STANDARD 250 LB.).

Trecarne Golden Dairy Girl 2nd	T. Petherick, Lockyer	5,936·05	343·209	Brampton Daffodil's Peer
Belgonia Peggy 37th	L. Oxenford, Oxenford	6,714·05	300·018	Baron Design Imp.
Gem Maudette	C. H. Edwards, Alderley	5,882·01	299·485	Bulby Oxford Gamboges
Trinity Crowning Duchess	J. Sinnamon and Sons, Moggill	6,733·	295·889	Trinity Crowning Effort

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Trinity Graceful Lady	J. Sinnamon and Sons, Moggill	7,071·25	342·153	Trinity Crowning Effort
Trinity Princess Rose	J. Sinnamon and Sons, Moggill	5,804·04	312·277	Trinity Lily's Lad
Trinity Princess Royal 2nd	J. Sinnamon and Sons, Moggill	5,542·88	301·795	Trinity Crowning Effort
Oxford Adelyn	Burton Bros., Wanora	5,841·24	289·244	Oxford Ajax

GUERNSEY.

JUNIOR, 3 YEARS (STANDARD 270 LB.).

Adaville Olivene	A. S. Cooke, Witta	6,283·45	355·242	Fernhill Rosebov

SENIOR, 3 YEARS (STANDARD 250 LB.).

Linwood Holly	A. S. Cooke, Witta	9,816·35	429·547	Warrawong Winter
Linwood Circuit	A. S. Cooke, Witta	6,780·13	298·847	Warrawong Winter
Laureldale Pretty	W. A. K. Cooke, Witta	5 828·2	282·992	Minna Murra Topsy's Sequel 2nd

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Linwood Feather	A. S. Cooke, Witta	9,182·85	406·041	Warrawong Winter
Linwood Bizarre	A. S. Cooke, Witta	5,825·55	281·016	Warrawong Winter
Linwood Beth	A. S. Cooke, Witta	5,290·65	269·645	Warrawong Winter

PRODUCTION RECORDING.

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Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
Senior, 3 Years (Standard 290 lb.).				
Ardilea Flower 8th	H. W. Hinrichsen, Clifton	8,810·75	362·399	Newstead Reliance
Silver Glen Princess	V. R. Nugent, Murgon	9,873·9	342·212	Aynsley Renell
Jamberoo Modesty 14th	V. Wyvill, Yarraman	8,397·36	313·501	Greyleigh Valiant
Senior, 2 Years (Standard 250 lb.).				
Blacklands Lady Jean 24th	R. Tweed, Kandanga	6,041·1	265·93	Blacklands Czar
Junior, 2 Years (Standard 230 lb.).				
Glen Idol Sadie 3rd	Estate P. Doherty, Gympie	7,236·	273·609	Blacklands Banker
Arolla Ellen	J. Crookey, Allora	6,898·	260·944	Parkview Highbrow
Sunlit Farm Poppy 2nd	W. H. Sanderson, Mulgeldie	5,755·35	240·007	Blacklands Planet
JERSEY.				
Mature Cow (Standard 350 lb.).				
Trecarne Chimes 5th	T. A. Petherick, Lockyer	7,632·3	419·129	Jerseylea Golden Duke
Trecarne Dairymaid	T. A. Petherick, Lockyer	7,231·15	404·749	Trinity Some Officer
Trecarne Jersey Queen 2nd	T. A. Petherick, Lockyer	7,314·85	403·812	Trinity Some Officer
Kingsford Olive	J. W. Evans, Rosewood	7,294·	352·003	Oxford Saturn
Senior, 4 Years (Standard 330 lb.).				
Glengarriffe Fenian's Jessie	J. Ahern, Conondale	7,846·	423·636	Glengarriffe Cunning Fenian
Strathdean Honey	S. H. Caldwell, Bell	6,780·34	334·472	Glenmore' Amber's Volunteer
Junior, 4 Years (Standard 310 lb.).				
Oxford Carolyn	Burton Bros., Wanora	8,609·5	518·651	Oxford Daffodil's Count
Oxford Frances 2nd	Burton Bros., Wanora	8,336·5	424·101	Oxford Daffodil's Count
Gem Dolly	W. Bishop, Kenmore	6,853·35	325·976	Calton Lothean

JUNIOR, 3 YEARS (STANDARD 270 LB.).

Glenview Angeline	W. Muller, Marburg	6,155·75	311·651	Trinity Governor's Hope
Glenrandle Golden Girl (202 days)	P. Kerlin, Killarney	5,906·6	304·971	Bellgarth Stylish

SENIOR, 2 YEARS (STANDARD 250 LB.).

Tralee Audrey	W. Muller, Marburg	5,950·	334·78	Oxford Rivalli

JUNIOR, 2 YEARS (STANDARD 230 LB.).

Lermont Lynette 2nd	J. Schull, Oakey	5,465·1	319·216	Woodside Golden Volunteer
Kingsford Bluebell	J. W. Evans, Rosewood	600·25	277·133	Oxford Aster's Remus
Woodview Pearl	H. T. W. Barker, Oakey	4,565·6	241·52	Lermont Victory
Woodview Maid	P. H. Schull, Oakey	4,166·3	237·823	Trecarne Royal Officer

GUERNSEY.

JUNIOR, 3 YEARS (STANDARD 270 LB.).

Laureldale Duchess	W. A. K. Cooke, Witta	7,611·15	396·122	Minnamurra Topsy's Sequel 2nd
Laureldale Olga 4th	W. A. K. Cooke, Witta	6,216·8	305·555	Minnamurra Topsy's Sequel 2nd

REGISTERED HATCHERIES

REGISTRATION of poultry hatcheries entails the blood testing of the poultry and the removal of birds found to be affected with pullorum disease, or are otherwise unsuitable for breeding purposes.

Hatchery owners who have applied for the registration or the removal of the registration of their hatcheries are listed hereunder:—

Owner.	Name of Hatchery.	Breeds.
N. W. Alfredson, Geebung street, Geebung	Selby	Australorps
V. H. Allen, Oxley road, Oxley	Alaura	White Leghorns, Australorps, Langshans, Rhode Island Reds
I. M. Armstrong, Randall road, Wynnum West	Chanticler	Australorps
A. J. Barnes, Handford road, Zillmere	Zillmere	White Leghorns, Australorps, and Langshans
J. S. Bauer, Oakwood, Bundaberg	Triangle	Australorps and White Leghorns
C. and M. Birney, Archerfield road, Darra	Evenley	White Leghorns and Australorps
R. H. Bowles, Glenmore road, North Rockhampton	Glen Stud	White Leghorns and Australorps
C. W. Bowtell, 4 Payne street, Toowoomba	Downs	Australorps and White Leghorns
John Bowtell, North street, Wilsonton, Toowoomba	Downs	White Leghorns, Brown Leghorns and Australorps
E. J. Brazier, 109 Bridge street, Toowoomba	Miamba	Australorps and White Leghorns
H. Brazil, Beaudesert road, Eight Mile Plains	Brazil's	Australorps, White Leghorns, Rhode Island Reds, Welsummer, and Minorcas
C. M. Bryce, Postal street, Oxley	Celny	White Leghorns and Australorps
Percy J. C. Bygrave, Box 24, P.O., South Brisbane	Craigan Farm	Australorps and White Leghorns
J. Cameron, Oxley Central	Cameron's	Australorps and White Leghorns
W. Carr and **A. B.** and **A. T. M. Watson**, Logan and Creek roads, Mount Gravatt	Bellview Stud	White Leghorns and Australorps
J. L. Carrick and Son, Manly road, Tingalpa	Craigard	White Leghorns and Australorps
A. R. Chard, Chard's road, Bundaberg	Sunnyland	Australorps, White and Brown Leghorns
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
Alfred Cowley, The Gap, Ashgrove	Melody	White Leghorns
C. M. Cullinane, Upper Mount Gravatt	Rushoin	White Wyandottes and Australorps
V. R. Dearling, 85 Holberton street, Toowoomba	Downs	White Leghorns, Australorps, and Brown Leghorns
E. Eckert, Head street, Laidley	Laidley	Australorps, Langshans, and White Leghorns
Elks and Sudlow, Beerwah	Woodlands	White Leghorns and Australorps
F. G. Ellis, Old Stanthorpe road, Warwick	Sunny Corner	Australorps
W. Ellison, junr., Bald Knob, Landsborough	Willeden	White Leghorns
C. Erbacher, 75 Ramsay street, Toowoomba	Rhode Island Red	Australorps
L. D. Fraser, 69 Ramsay street, Toowoomba	Downs	Australorps
W. H. Gibson, Manly road, Tingalpa	Gibson's	White Leghorns and Australorps
Gisler Bros., Wynnum road, Wynnum	Gisler Bros.	White Leghorns and Australorps
H. J. Greer, Church road, Zillmere	Iona	White Leghorns and Australorps
W. G. Gregory, Deeragun, Ingham Line	Rocks Stud	White Leghorns, Australorps, and Rhode Island Reds
F. P. Grillmeier, Milman	Mountain View	Minorcas and Australorps
T. A. Haggquist, Edmonton	White Rocks	
G. Hall, Kin Kin	Kin Kin	Australorps
P. Haseman, Stanley terrace, Taringa	Black and White	White Leghorns and Australorps
F. E. Hills, Sims road, Bundaberg	Littlemore	Rhode Island Red, Australorps White Leghorns, White Wyandottes, and Langshans
A. E. Hoopert, 24 Greenwattle street, Toowoomba	Kensingson Stud	Australorps and Rhode Island Reds
H. Hufschmid, Ellison road, Geebung	Meadowbank	White Leghorn, Brown Leghorns, Minorca, Australorps, and Rhode Island Reds
E. C. Knoblauch, Mount Gravatt	Lucinda Park	White Leghorns, Australorps, and Anconas
E. C. Kolberg, Handford road, Zillmere	Gerbera	Australorps
W. A. Lehfeldt, Kalapa	Lehfeldt's Australorp	Australorps

REGISTERED HATCHERIES—*continued.*

Owner.	Name of Hatchery.	Breeds.
W. A. Luke, 108 Russell street, Toowoomba	Downs	White Leghorns, Brown Leghorns, Australorps, and Rhode Island Reds
J. McCulloch, Whites road, Manly	Hindes Stud	White Leghorns, Brown Leghorns, and Australorps
W. S. MacDonald, Babinda	Redbird	Rhode Island Reds and Anconas
A. Malvine, Waterworks road, The Gap, Ashgrove	Alva	Australorps and White Leghorns
H. L. Marshall, Kenmore	Stonehenge	White Leghorns and Australorps
W. J. Martin, Pullenvale	Pennington	Australorps, White and Black Leghorns
A. Mawhinney, Robinson road, Aspley	Aspley	White Leghorns, Australorps, and Rhode Island Reds
C. Mengel, New Lindum road, Wynnum West	Mengel's	Australorps
D. G. Miller, Nerimbera, via Lakes Creek	Nerimbera	White Leghorns
E. C. Moore, Hyde road, Yeronga	Yeronga	Australorps and White Leghorns
C. J. Nielsen, Kensington street, Bundaberg	Bona Vista	Australorps, White Leghorns, and Rhode Island Reds
S. V. Norup, Beaudesert road, Cooper's Plains	Norup's	White Leghorns and Australorps
H. Ubst and Sons, Shepperd	Collegeholme	White Leghorns and Rhode Island Reds
A. C. Pearce, Marlborough	Marlborough	Australorps, Rhode Island Reds, Light Sussex, White Wyandottes, Langshans, Khaki Campbell Ducks, Indian Runner Ducks, and Bronze Turkeys
P. A. Pearce, Paynes road, The Gap, Ashgrove	Berea	White Leghorns, Australorps, and Rhode Island Reds
W. J. Perkins, 110 Neil street, Toowoomba	Rhode Island Red	Rhode Island Reds
G. Pitt, Box 132, Bundaberg	Pitt Poultry Breeding Farms	White Wyandottes, White Leghorns, Brown Leghorns, Australorps, Rhode Island Reds, Langshans, and Light Sussex
J. C. and G. E. Raff, Musgrave road, Sunnybank	Brundholme	White Leghorns, Australorps, and Rhode Island Reds
G. R. Rawson and Son, Upper Mount Gravatt	Rawsons'	Australorps
J. Richards, P.O., Atherton	Mountain View	Leghorns and Australorps
J. Rogoff, Woodridge	Kingston road	Australorps
C. L. Schlencker, Handford road, Zillmere	Windyridge	White Leghorns
S. E. Searle, New Cleveland road, Tingalpa	Tingalpa Stud	White Leghorns and Australorps
N. G. Seymour, Palm Avenue, Sandgate	Sohufa	Australorps, Black Leghorns, and White Leghorns
J. Schumann, 291 Bridge street, Toowoomba	Downs	White Leghorns, Brown Leghorns, Rhode Island Reds, and Australorps
W. B. Slawson, Mitchelton	Kupidabin	White Leghorns, Australorps, and Light Sussex
T. Smith, Isis Junction	Fairview	White Leghorns and Australorps
H. A. Springall, Progress street, Tingalpa	Springfield	White Leghorns
A. Stehn and Son, 285 West street, Toowoomba	Red Spot	Australorps, Rhode Island Reds, White Leghorns, and Brown Leghorns
R. Stockman, Kairi	Tinaroo	White Leghorns and Rhode Island Reds
R. Taylor and **H. Cuerel**, 370 Montague road, Hill End	Bel-Air	Australorps and White Leghorns
E. G. Thorpe, Box 36, Goomeri	Thorburn Electric	White Leghorns, Australorps, and Rhode Island Reds
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkins'	White Leghorns, Australorps, and Rhode Island Reds
J. R. Twigg, Crown street, Geebung	Piccadilly	White Leghorns, Australorps, and Langshans
G. A. C. Weaver, Herberton road, Atherton	Weavers'	Australorps, White and Brown Leghorns, Anconas, Minorcas, Rhode Island Red, Indian Game, and Bantam
F. H. J. Weeks, Bajool	Glen Brae	White Leghorns and Australorps
Mrs. V. M. White, Archerfield road, Darra	Viola	White Leghorns and Australorps
Mrs. L. M. Wooller, Huet street, Rockhampton	Riverview	White Leghorns and Australorps
E. M. Winter, 5 Rose street, Toowoomba	Downs	White Leghorns
P. A. Wright, Laidley	Chillowdeane	White Leghorns, Brown Leghorns, and Australorps

Plate 26.

ON THE ROAD TO COOLABUNIA, NEAR KINGAROY.

GENERAL NOTES

Stock Food Rationing Applications.

The Minister for Agriculture and Stock, Mr. T. L. Williams, has announced that those who during the months of October to January, inclusive, desire to purchase crude protein, meat meal, bran or pollard for feeding to dairy cattle on farms supplying milk for human consumption, pigs, and/or calves, also farmers supplying milk to cheese factories, should make application before the 7th August. These forms are now available from all branches of the Department of Agriculture and Stock.

Poultry keepers who received a ration during the period June to September, irrespective of the size of flocks, need not apply for rations of crude protein, bran, pollard or commercially prepared mashes for the ration period October to January inclusive. Their rations will automatically be forwarded in due course, but any changes of address or sales of poultry should be notified to the Department immediately. Poultry keepers who applied for a ration during the period June to September and did not receive one because of the lateness of their applications should make fresh application if they are still keeping poultry. Application forms will be sent to them if requested.

Dairy Farmers' Ballot.

The Minister for Agriculture and Stock (Mr. T. L. Williams) has announced that the preparation of the voters' roll for the ballot of dairy farmers on the question of extending Section 30 of *The Primary Producers' Organisation and Marketing Acts* with modifications to the dairying industry had progressed sufficiently to enable a date to be fixed for the holding of the ballot. Ballot-papers will be despatched to all dairymen on the roll on or about 27th August, and voting will close at 5 p.m. on Thursday, 4th October.

A draft of the modified Section 30, as it would be applied to the dairying industry in the event of the ballot being carried, will be attached to each ballot-paper. The Minister, in referring to the period which would elapse between the posting of the ballot-papers and the closing of the poll, said that it was necessary to allow ample time for the return of the ballot-papers to ensure that every dairy farmer in the State shall have an opportunity of recording his vote.

Far East Prisoners of War.

Up to 11th April of this year, 780 radio messages have been received in Australia from prisoners of war in the Far East, acknowledging or answering messages sent out under the Group Message Scheme arranged by the Commonwealth Government last year. With the exception of a few sent from Batavia, all were from Singapore. Number of messages sent from Australia by the same date amounted to 8,560, so that less than 10 per cent. had been acknowledged.

Under the cable service inaugurated by the Australian Red Cross Society this year, to enable messages to be exchanged between prisoners of war in the Far East and next-of-kin in Australia, approximately 22,000 ten-word messages have been lodged in Australia to be transmitted through Geneva to the Far East. Meanwhile, the service has begun from the other end, too.

The Japanese Government agreed to allow prisoners of war to send cables to relatives in Australia if the cost were borne by the Australians, and so total cost for messages both ways was undertaken by the Red Cross Society. It amounts to approximately £100,000. To date, sixty-two cable messages have come into Australia from Far East prisoners of war.

Ginger Board.

An Order in Council has been issued under "*The Primary Producers' Organisation and Marketing Acts*" extending the operations of the Ginger Board for the period from 16th July, 1945, to 15th July, 1951.

Rural Topics

Plan for World Farm Organisation.

The British Farmers' Delegation which was out here in February last is now back home. On their way the members of the delegation completed a tour of Canada. When in Queensland these British farmers made it very clear that they were after some form of world farm organisation. Incidentally, they were greatly taken with the productivity of the Darling Downs and the sheer beauty of the countryside around Warwick, Toowoomba, and Kingaroy. They found, however, that we had not only good crops and scenery to sell, but also ideas about co-operative organisation. Speaking to members of the Farmers' Club in Britain recently, the leader of the delegation, Mr. James Turner, who also is the President of the National Farmers' Union of Britain, had a lot of interesting things to say of their tour of the Dominions.

Each country visited, Mr. Turner said, had accepted a tentative invitation for a nationally representative organisation to attend a conference of Empire producers which it is hoped to hold in London some time in the near future. One of the first objects of the conference would be an approach to Government organisations concerned with food and agriculture to obtain representation of producers' interests. Lack of producer representation at the Hot Springs food conference was a defect which must be remedied.

There seemed to be in certain quarters, even now, an opinion that the fate of those who, in the past, had provided the country with food was no concern of Britain's. This was a fallacy. It was vital that potential customers, Mr. Turner continued, for British manufacturers should have stable markets for their own exports. If Britain's full employment programme were successful, there was no reason why the volume of her food imports should not be as big as, or possibly bigger than before the war, when Britain had 3,000,000 unemployed and millions with no overflow of income.

The coming Empire conference of producers, Mr. Turner added, would have to consider the constitution of a permanent international farm organisation whose broad functions would be to advise any inter-governmental machine concerned with food and agriculture.

Talking to Murgon and Kingaroy farmers recently, the leader of the United Kingdom Food Mission in Australia, Mr. W. Bankes Amery, stressed the point that Australian dairy farmers particularly need not fear any loss or restriction of markets for their export surplus when the war is over. That is all right, but it seems obvious that Australian farmers should be strongly represented at the forthcoming London conference, so that their viewpoint should be given full and proper consideration.

Value of Lime.

Lime fulfils many functions which are essential to soil fertility. Its most useful action is neutralising the acidity of strongly acid soils, for with the removal of acidity the other valuable effects of liming follow. Lime improves the physical condition of heavy acid soils, ensuring better drainage and aeration, and making cultivation easier, and is an essential plant nutrient, and when present in sufficient amount promotes many phases of bacterial activity, especially those ultimately bringing the reserves of nitrogenous material in the soil into the soluble forms of nitrogen which plants utilise.

There is no foundation for the common statement that exposure of acid soil to sun and air "sweetens" or reduces its acidity. Acidity is developed through an insufficiency of lime in the original soil-forming material, or by the loss of lime, through leaching, and absorption by plants. Acidity thus developed can only be counteracted in field or garden practice by the use of some form of lime.

Why We Should Plant Trees.

Tree-planting time has come round again, so reasons for planting suitable trees in suitable places on the farm and around our country centres may be restated. Here are three main reasons, anyhow:—Firstly, there's the aesthetic value of trees, the beauty they give to the countryside; secondly, there's the shelter value of trees—shelter for land to prevent top soil going with the wind, shelter for stock from winter westerlies and summer sun, and shelter for orchards and gardens; thirdly, there's the economic value of trees as suppliers of timber and firewood on the farm, or, as with some of our native trees, such as the kurrajong, as a stock food standby in a dry time.

The beauty value of trees appeals to everyone, yet it is surprising the number of farms there are without evidence of the slightest attempt to beautify farm surroundings. Farmers are usually too busy, especially in these days of labour shortage and other difficulties, to sit in the shade of a kurrajong and admire the scenery. Tree-planting schemes in country centres—such as Toowoomba and Warwick, Charleville and Barcaldine, Kingaroy and Murgon—are, however, evidence of the beautiful setting suitable trees can provide for homesteads and towns.

When it comes to the choice of trees for a particular locality, good advice can always be got from the Government Botanist, or from park superintendents in district centres, or from experienced neighbours.

Most farmers will want something that will eventually prove profitable as timber, fencing, and fuel. Here again the Government Botanist would, no doubt, advise on the best species to grow in any given locality, having regard for climatic and other conditions.

TOTAL ECLIPSE OF THE SUN.

The eclipse of the sun which occurred on 9th July and which was described in last month's issue was not visible in Australia. Totality was observed within a path approximately 60 miles wide, stretching from Boise in the west of the United States, across Hudson Bay,

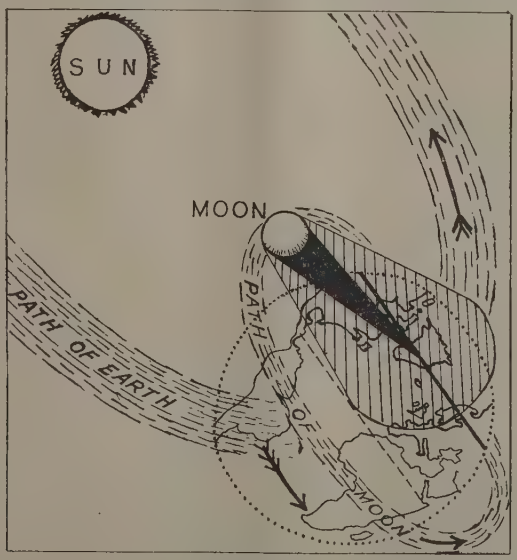

Plate 27.

Greenland, Sweden, and Finland to east of the Caspian Sea in Asia. The accompanying diagram (not to scale) which was crowded out of the *Journal* for June illustrates the conditions of this interesting phenomenon.

Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

POSTURE—ITS IMPORTANCE IN CHILDHOOD. (Part 1.)

THROUGHOUT childhood health and growth go on together, and if parents wish their children to have healthy bodies they should never relax their vigilant care. Many mothers and fathers know—to their very literal cost—how expensive the correction of physical defects may be. Remedial treatment for round shoulders, flat feet and many other forms of incorrect posture, not to mention the correction of crooked teeth and other dental deformities, are a long and slow process costing much time as well as money. Most of these defects need never occur if only parents understood that the body should not only be built rightly but used rightly. For correct building of the body, the baby should have from the beginning sunshine, fresh air day and night, and a good diet which includes foods to build strong bones and muscles. Regular habits, good exercise, sufficient rest and sleep and correct clothes and shoes are all necessary in developing the right posture as the body grows.

Posture or position of the body is the way the bony framework of the body is held while standing, sitting, or lying. Children who stand and sit straight are more apt to be healthy because the organs of the body—such as the heart, lungs, and kidneys—are held in the right position to do their work.

Commence with the baby. From babyhood onwards, faulty positions should be watched for and guarded against. The rapidly-growing framework of the baby's body is soft and pliable to a degree and "as a twig is bent so the tree grows."

The baby's cot and pram should be long enough to allow the child to stretch right out. The mattress should be firm without any sag. An old mattress sagging in the middle is a very bad bed for any child. Avoid old soft kapoc or feather mattresses, as they tend to produce wrong positions during sleep and are enervating. A good hair mattress is the best, but if kapoc or flock is used the mattress should be full and well studded. For babies and very young children a loose shakedown of oaten or wheaten chaff placed on top of a firm mattress makes a soft, warm, and healthy bed. The Sister at the District Welfare Centre will show you how to make it. The essential thing to remember is that the firm studded mattress underneath gives the firmness that is necessary for the young body during the hours of sleep and rest. Pillows are unnecessary for babies or any small children; high pillows are very injurious and produce very bad posture, round shoulders, and narrow chests. If a pillow is used at all, it should be a small thin one filled with oaten chaff. Visualise the natural position of the baby's body at rest, the spine flat and the head on a level with the trunk. Children naturally tend to sleep lying almost chest downward with the head turned to one side and the knees drawn up. This

makes any tendency to rounding of the shoulders impossible during sleep. Soft beds and high pillows prevent a child adopting this natural position. The baby should not be forced to sit up or stand before he attempts to do so himself. If he has been correctly fed and has lots of kicking exercise in the fresh air and sunshine he will feel strong enough to do these things at the right time. He should not be sat up in a stroler before he is able to sit up well without support. How common it is to see an unfortunate infant sagging forward over the strap of his stroller when he should be lying almost flat. Baby's clothing and bootees should not continually pull or push the body out of the right position.

These notes on posture will be continued next month. In the meantime questions on this or any other subject concerning Maternal and Child Welfare will be answered by communicating personally with *The Maternal and Child Welfare Information Bureau*, 184 St. Paul's Terrace, Brisbane, or by addressing letters, *"Baby Clinic, Brisbane."* These letters need not be stamped.

IN THE FARM KITCHEN.

Some Tasty Soups.

Green Pea Soup.

Take 2 lb. of old green peas, 1½ pints of stock, 1 pint of milk, 1 sprig of mint, 1 oz. butter, ½ oz. cornflour, salt and pepper.

Shell the peas. Wash the pods well and put them in a saucepan with the stock. Simmer for 20 minutes, strain, and return the stock to the saucepan, add the peas and mint and simmer until they are tender. Then rub through a sieve. Add to this puree the butter, the milk mixed with the cornflour and a good seasoning of salt and pepper. Stir while the mixture boils for eight minutes. A little cream, though it is not necessary, is a great improvement to this soup.

Curried Potato Soup.

Boil some potatoes in water until done; drain the water, and add 4 cups of milk and 1 tablespoon of curry powder and salt to taste. The potatoes must be broken up in the saucepan, which is easily done with a wooden spoon. The quantity of potatoes used depends on the number of people as well as the size of the potatoes. One can use more or less one cup of milk for each person.

Melon Soup.

Take a melon, not too ripe, and cut the flesh into small pieces. Toss the pieces in butter in a deep pan, season with salt and pepper, and add two pints of boiling milk. Bring to the boil and simmer for 30 minutes. Press through a sieve, return to the pan, and reheat. Just before serving stir in the well-beaten yolk of egg and one tablespoon of cream.

Jellied Soup.

One pound tomatoes, 1 onion, 1½ pints water, 1 oz. flour, ¾ pint milk, salt and pepper, 1 oz. gelatine.

Slice tomatoes and onions, add seasoning, and cook in the water till tender. Press through a colander. Make a white sauce with the flour and milk and boil three minutes. Then add the tomato pulp gradually till the mixture is smooth. Bring to boiling point and stir in gelatine previously dissolved in hot water. Pour into individual moulds (or cups) and leave to set.

If you wish to keep your tomatoes for other purposes, try making a thick vegetable soup and jellying it, the proportion of gelatine to use being one dessertspoon to half a pint of liquid.

Rubber Rings for Fruit Preserving Jars.

Rubbers for fruit preserving jars should be in good condition to ensure a good seal. To test them, fold and press firmly between the fingers or stretch them well, when they should not crack or change shape. All rubbers should be kept in hot water a few minutes before using.

Danger of tainting from the black reclaimed rubber rings which have recently been on the market can be obviated by the following treatment:—Before use place them in cold water (about 1 pint) to which two or three teaspoons of washing soda have been added. Bring to the boil, and boil for ten minutes. Rinse and then boil in fresh water.

ASTRONOMICAL DATA FOR QUEENSLAND.

AUGUST.

Supplied by the Astronomical Society of Queensland.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			MINUTES LATER THAN BRISBANE AT OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	6.30	5.18	Cairns	15	42	Longreach	29	40
6	6.27	5.21	Charleville	26	28	Quilpie	36	34
11	6.23	5.23	Cloncurry	41	58	Rockhampton ..	4	16
16	6.19	5.26	Cunnamulla ..	30	28	Roma	16	18
21	6.14	5.28	Dirranbandi ..	21	17	Townsville	15	35
26	6.10	5.31	Emerald	14	24	Winton	33	47
31	6.04	5.33	Hughenden ..	26	44	Warwick	4	4

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
		a.m.
1	..	11.24
	a.m.	p.m.
2	12.44	12.06
3	1.48	12.51
4	2.52	1.40
5	3.54	2.35
6	4.52	3.32
7	5.45	4.31
8	6.33	5.31
9	7.15	6.28
10	7.52	7.24
11	8.27	8.18
12	8.59	9.11
13	9.29	10.02
14	10.01	11.54
15	10.33	11.46
16	11.07	..
		a.m.
17	11.44	12.40
	p.m.	
18	12.26	1.34
19	1.14	2.30
20	2.07	3.25
21	3.05	4.19
22	4.07	5.11
23	5.11	5.59
24	6.17	6.43
25	7.23	7.25
26	8.28	8.05
27	9.32	8.43
28	10.37	9.23
29	11.42	10.05
30	..	10.49
	a.m.	
31	12.45	11.38

MINUTES LATER THAN BRISBANE (SOUTHERN DISTRICTS).

Charleville	27;	Cunnamulla	29;	Dirranbandi	19;
Quilpie	35;	Roma	17;	Warwick	4.

MINUTES LATER THAN BRISBANE (CENTRAL DISTRICTS).

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	14	23	30	39	5	14	34	45
6	11	28	26	43	1	19	29	52
11	16	21	31	38	7	12	36	43
16	25	13	41	28	16	3	47	32
21	28	11	44	26	19	1	51	29
26	19	18	35	34	10	9	40	38
31	12	27	27	43	2	18	30	51

MINUTES LATER THAN BRISBANE (NORTHERN DISTRICTS).

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	16	39	42	57	27	42	16	33
3	12	43	39	59	24	45	12	36
5	7	50	36	63	21	49	8	42
7	8	48	37	62	21	48	8	40
9	13	42	40	59	25	44	14	36
11	21	34	45	54	30	39	19	29
13	30	25	51	47	35	32	25	22
15	39	16	56	42	41	27	33	16
17	46	12	61	39	46	24	37	13
19	51	6	65	35	49	21	42	8
21	50	6	64	35	48	21	41	8
23	44	11	60	38	45	24	36	12
25	34	21	54	45	38	30	29	19
27	23	32	46	52	31	37	21	27
29	13	42	39	58	24	44	13	35
31	10	48	38	62	23	48	10	40

PHASES OF THE MOON.

New Moon, August 8th, 10 h. 32 m.; First Quarter, August 16, 10 h. 26 m.; Full Moon, August 23rd, 22 h. 03 m.; Last Quarter, August 30th, 13 h. 44 m.

DISCUSSION.

On August 20th the Sun rises and sets approximately 15 degrees north of true east and true west respectively.

On August 26th the Moon rises approximately true east.

Venus.—At the beginning of the month this planet, just north of Orion, will rise between 3.30 a.m. and 4.15 a.m. During the month it passes through the constellation of Gemini, and by the end of the month will reach the constellation of Cancer, rising between 4 a.m. and 4.30 a.m. about 20 degrees north of true east.

Mars.—At the beginning of the month Mars will rise between 2 a.m. and 2.45 a.m. about 23 degrees north of true east. On the 7th of the month it passes very close to Aldebaran in Taurus. By the end of the month it will rise between 1.45 a.m. and 2.30 a.m. about 25 degrees north of true east.

Jupiter.—This planet, at the beginning of the month, will set between 9 p.m. and 10 p.m. about 3 degrees north of true west. At the end of the month it will set between 7.15 and 8.15 p.m. almost true west.

Saturn.—At the beginning of this month Saturn is observable low in the east during morning twilight, rising in Queensland between 5.15 a.m. and 5.45 a.m. about 23 degrees north of true east. On the 22nd it passes 0.7 degrees north of Venus. By the end of the month it will rise between 3.15 and 4 a.m. about 23 degrees north of true east.

ILLUSTRATION OF OUR SOLAR SYSTEM.

After the discussion on our Solar System in the February issue it was intended that the following illustrations should be given. In the ordinary dining-room let the top of the table in the centre of the room represent the plane of the Earth's orbit, the edge of the table the Earth's path, and the chairs and furniture, &c., BACK FROM THE TABLE, the constellations in space. Objects above and below the table also represent constellations. On the centre of the table place a ball, which is to remain stationary, to represent the Sun. An orange or tennis ball with a stick through the centre to represent its poles and with a line round the middle to divide the northern hemisphere from the southern can be moved round the edge of the table to act as the Earth. The paths of Mercury and Venus, being inside the orbit of the Earth, will be represented by small objects moved in circles on the top of the table and with the "Sun" at the centre of the circles, Mercury, of course, having the smaller circle. The paths of the other planets are outside the orbit of the Earth, and therefore, in this illustration, will move round the "Sun" in circles off the table but on a level with the table-top. These outer planets, however, are not nearly as far away as the constellations and will thus move between the table and the furniture. The paths of the planets are almost circular with the "Sun" as centre and do not cross one another. Now, if the eye be placed at the orange as it is moved round the edge of the table it will be observed that the "Sun" appears in the direction of the different objects round the room on a level with the top of the table. Thus it is not because of any movement of the "Sun" that it appears in the direction of different constellations. It is because of the Earth's yearly journey round "Old Sol." It is this path which the Sun appears to make among the stars in the plane of the Earth's orbit that is called the ecliptic.

QUEENSLAND WEATHER IN JUNE.

The disturbed weather, mainly of out-of-season monsoonal energy which commenced late part of May, continued until 11th June, with rain areas benefiting many districts in the south-east quarter of the State as well as parts of the Central Coast. The Central Coast East, Central Highlands and Lowlands, Darling Downs West, and Maranoa all received district averages of 2 to 2½ inches, the Darling Downs East nearly 5 inches, and the South Coast Moreton nearly 7 inches (mostly flood falls southern half). The Port Curtis, with about 2 inches, was somewhat under normal. In the dry Warrego sections, falls were only patchy and insufficient, and no rain relief was afforded in the adverse wintering conditions in the pastoral areas of the South-West, Lower and Upper West. The general pastoral outlook, however, had definitely maintained improvement from the Central Interior to the Central Coast and across the Maranoa to the South Coast areas. The dairying and agricultural position in the South-East and Central Coast divisions is now good, especially in the Downs and Moreton sections. In the wheat areas, sharp frosts during the last week of the month were welcome as a check to luxuriant growth.

Heavy Daily Rainfalls (Moreton).—11th, Mount Tamborine 1,104 points, Nerang 1,220, Tallebudgera 1,000 points. *Heavy three-day totals.* 10th/12th, Tallebudgera 1,263, Coolangatta 1,055, Southport 1,024, Burleigh 1,010, Tamborine Mountain 1,549 points. Darling Downs, 10th/12th, Killarney 710, Dalveen 548. Metropolitan, 11th/12th, Sunnybank 886 points.

Temperatures were exceptionally mild, especially the first three weeks. Except for about normal to slightly under average temperatures on the Atherton Plateau and adjacent hinterland both maximum and minimum readings were well above normal, the former from approximately 1.4 deg. at Mitchell to 5.1 deg. at Boulia, and the latter from 1.7 deg. at Boulia to 7.2 deg. at Thargomindah.

Frosts mainly the last few days in Central and Southern Interior districts. Stanthorpe reported frosts on nine nights, with minimum readings on the 25th (26/19 deg.), Warwick 31/25 deg., Toowoomba 25 deg. (terrestrial). Tambo reported 32/31 deg. on the 30th, and Herberton, during a cold snap, reported 38/33 deg. (13th) and 37/33 deg. (16th).

The rain position is summarised below—

Division.	Normal Mean.	Mean June, 1945.	Departure from Normal.
	Points.	Points.	Per cent.
Peninsula North	58	45	22 below
Peninsula South	45	4	91 ,,
Lower Carpentaria	51	2	96 ,,
Upper Carpentaria	83	92	11 above
North Coast, Barron	205	125	39 below
North Coast, Herbert	285	244	14 ,,
Central Coast, East	197	266	35 above
Central Coast, West	130	87	33 below
Central Highlands	159	278	75 above
Central Lowlands	117	274	134 ,,
Upper Western	67	36	46 below
Lower Western	73	6	92 ,,
South Coast, Port Curtis	251	191	24 ,,
South Coast, Moreton	297	653	120 above
Darling Downs East	183	494	170 ,,
Darling Downs West	159	251	58 ,,
Maranoa	158	206	30 ,,
Warrego	134	72	46 below
Far South-West	101	31	69 ,,

Commonwealth of Australia Meteorological Bureau, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

MAY RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	May.	No. of years' records.	May, 1944.	May, 1945.		May.	No. of years' records.	May, 1944.	May, 1945.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	2·34	42	0·11	4·02	Gatton College ..	1·53	44	1·57	1·64
Cairns	4·51	61	0·33	8·75	Gayndah	1·55	72	2·69	0·99
Cardwell	3·64	71	1·18	4·67	Gympie	2·91	73	2·21	1·58
Cooktown	2·76	67	0·10	3·80	Kilkivan	1·85	62	1·81	0·62
Herberton	1·72	57	0·05	2·07	Maryborough ..	3·01	72	1·88	2·94
Ingham	3·76	51	0·12	5·40	Nambour	5·09	47	2·33	2·75
Innisfail	12·39	62	0·54	9·33	Nanango	1·55	61	2·35	1·59
Mossman	3·10	19	0·78	6·06	Rockhampton ..	1·60	72	1·77	1·48
Townsville	1·24	72	0·34	0·51	Woodford	3·03	55	2·16	3·16
Central Coast.					*Central Highlands.*				
Ayr	1·09	56	..	0·61	Clermont	1·29	72	1·81	1·41
Bowen	1·28	72	0·33	1·77	Springsure	1·23	74	0·63	0·97
Charters Towers ..	0·78	61	0·25	0·38					
Mackay	3·86	72	1·05	2·80	*Darling Downs.*				
Proserpine	4·22	40	0·30	4·81	Dalby	1·29	73	0·81	0·50
St. Lawrence ..	1·74	72	1·11	2·56	Emu Vale	1·12	47	1·73	1·30
					Jimbour	1·21	64	1·27	0·83
South Coast.					Miles	1·51	58	0·68	0·62
Biggenden	1·80	44	3·11	1·38	Stanthorpe	1·75	70	1·13	1·49
Bundaberg	2·63	60	2·34	2·02	Toowoomba	2·14	71	1·38	2.00
Brisbane Bureau ..	2·77	93	2·34	2·95	Warwick	1·48	78	1·41	1·88
Caboolture	3·27	67	2·03	2·72					
Childers	2·17	48	3·65	1·60	*Maranoa.*				
Crohamhurst	5·04	50	2·26	4·02	Roma	1·42	69	0·07	0·06
Esk	2·00	56	2·73	1·79	St. George	1·41	62	1·01	1·31

CLIMATOLOGICAL TABLE FOR MAY.

(Compiled from Telegraphic Reports.)

Divisions and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cairns	..	81	65	86	4	52	17	875	13
Herberton	..	71	52	78	7, 14	33	17	207	14
Townsville	..	80	61	86	1	50	18	51	3
Brisbane	30·12	73	56	82·1	6	48·9	16	295	13
Darling Downs.									
Dalby	..	71	47	80	4, 5, 6	37	18	50	5
Stanthorpe	..	64	40	72	1, 2	28	10, 18	149	8
Toowoomba	..	66	46	77	7	35	18	200	9
Mid-Interior.									
Georgetown	30·10	84	56	92	2, 3	40	16	11	2
Longreach	30·11	79	53	91	4	41	16	109	4
Mitchell	30·11	72	45	84	4, 5	33	18	30	2
Western.									
Burketown	..	86	59	96	4	46	17	68	1
Boulia	30·11	80	53	95	5	40	17	..	..
Thargomindah	30·12	74	54	90	4	43	17	79	2

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